Official Journal of
The American Radio
Relay League

QST

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AMATEUR RADIO

June 1997

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QST reviews:

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AOR AR7030 receiver

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ICOM 97

BASE STATIONS

NEW!

IC-706MKII*

All Mode Transceiver • HF + 6M (100 W) SSB/CW/AM/FM

HF+6M+2M!

RTTY • 2 M (20 W) SSB/CW/FM/RTTY • Detachable Control Panel/Display** • SSB/CW/AM Narrow Filter Options • 101 Alphanumeric Memories • General Coverage Rx • Noise Blanker • IF Shift • Preamp Attenuator • CW Keyer • CW Pitch Control • Full Break-in (QSK) • Speech Processor • VOX • LCD Display with 1 Hz Readout • Easy-to-use Menu System • Tone Encode Built-In • 2 Antenna Connectors • 6.6"(W), 2.3"(H), 7.9"(D), 5.5 lb

IC-775DSP

Pull Out Those Weak Signals! • IF-DSP (Digital Signal Processing) on Tx and Rx • 200 W Stable Output Power • SSB/AM/FM/XCW/RTTY • Built-In Heavy Duty Power Supply • Built-In Auto Antenna Tuner • DSP Notch Filter • Adjustable DSP Noise Reduction • Level/Width Variable Noise Blanker • PSN Modulation • 16.7"(W), 5.9"(H), 15.4"(D), 36.8 lb

NEW!

IC-756

New HF+6M! • 4.9" Concentrated Information LCD Dot Matrix Display with Spectrum Scope, Alphanumeric Memories and Soft Key Buttons • 100 W Stable Output Power (40 W AM) • SSB/AM FM/CW/RTTY • Built-In Automatic Antenna Tuner • 101 Memory Channels • Automatic Audio Notch Filter • Twin PBT • Dual Watch • 13.4"(W), 4.4"(H), 11.2"(D), 23.1 lb

Adjustable IF-DSP!

IC-821H 2M/440 MHz Advanced Satellite/Digital Base Station

• All Modes • Easy to Use! • Continuous Adjustable Transmit Power • Sub Band Transmit • 9600 Full Compatibility Out of the Box • 160 Memories • Noise Blanker & IF-Shift on Main & Sub bands (independent main/sub Rx) • Built-In Electronic Keyer • Compact! 9.5"(W), 3.7"(H), 9.4"(D), 11.0 lb

HANDHELDS

IC-W32A 2 M/440 MHz Dual Band

• 5 Watts Out of the Box! • No Function Key! • 200 Memories with Alphanumeric Display, Messaging & Paging • "Intuitive" Help Display • Backlit Display & Key-pad • Wide Band Rx (Including Air Band) • V/V, V/U, U/U Operation with VHF/UHF Tuning Knob Exchange • Encode/Decode • 2.2"(W), 4.9"(H), 1.2"(D), 12 oz

NEW! *ICOM's Most Affordable!*

IC-T2A

2M Single Band • PC Programmable!** • Built-In CCSS Encode/Decode with Pocket Beep & Tone Scan • Rugged Aluminum Chassis • 8 Programmable Key • 43 Memory Channels • Uses Ni-Cd or Alkaline Power (8 Ni-Cd "AA" Included) • 4.5 W of Power • 2.3"(W) 5.5"(H), 1.3"(D), 10.9 oz

IC-T22A/IC-T42A

2M/440 MHz Single Band • Fun, Shirt Pocket Small & Easy to Use! • Large Alphanumeric Display • Wide Rx Coverage • 5 W @ 13.5 V (3 W Out of the Box) • Air Band Rx • 80 Memory Channels (40 w/ Alpha Display) • 2.3"(W), 4.3"(H), 1.1"(D), 10.9 oz

IC-T7A 2M/440 MHz Dual Band • Dual

Bander at a Single Bander Size & Price! • Easy to Use! No Function Key • 4 W (2M)/3 W (440 MHz) @ 13.5V • "Intuitive" Help Display • CTCSS Encode/Decode • 2.5"(W), 4.8"(H), 1.1"(D), 11.3 oz

MOBILES

IC-2000H

2M Intermod Fighter! • Wide Band Rx (118–174 MHz) • Highly Intermod Resistant • 50 Watts of Power • 50 Memory Channels with Alphanumeric Display • AM Aircraft Rx • 5.9"(W), 2.0"(H), 5.9"(D), 2.4 lb

IC-2710H

2M/440 MHz Dual Band Mobile • 2M (50 watts)/440 MHz (35 W) • Detachable Control Panel** • Fast Scanning • 220 Memory Channels • PC Programmable • CTCSS Encode (decode opt.) • RF Attenuator • 8 DTMF Memory Switches • V/V, U/U Simultaneous Rx • Built-In Duplexer • 5.5"(W), 1.6"(H), 8.4"(D), 3.1 lb

NEW!

IC-207H 2M/440 MHz

Dual Band Mobile • 2M (45 W)/440 MHz (35 W) • Super-Compact Detachable Control Panel** with Big Keys, Big Knobs and Big Display • One-Touch Switch Between Bands • 9600 Baud Ready • 182 Memory Channels • CTCSS Encode/Decode • Faceplate: 4.4"(W), 1.6"(H), 1.1"(D)

RECEIVERS

IC-R10 Easy to Use Handheld!

• Wide Band Coverage – .5 - 1300 MHz† • All Mode: FM, WFM, AM, USB, LSB, CW • 'Real Time' Band Scope • New 'Signal Navigation' (SIGNAVI) Scan • 1000 Memory Channels

IC-R8500 Next Generation HF/VF/UHF World Receiver!

• Wide Frequency Range: 100 kHz – 2000 MHz† • All Modes • Superior Receive Characteristics • Built-In CI-V and RS-232C Hardware for Advanced Computer Control • IF-Shift • Audio Peak Filter (APF) • Noise Blanker (SSB/AM) • RF Attenuator • 1000 Channels • 2 Antenna Connectors

Most ICOM Radios are ...

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Call ICOM's brochure hotline: (206) 450-6088, or contact ICOM Technical Support in the HamNet forum on CompuServe® @75540,525 (Internet: 75540.525 @ compuserve.com.) *This device has not been approved by the Federal Communications Commission. This device is not, and may not be, offered for sale or lease, or sold or leased until the approval of the FCC has been obtained. **Optional Equipment required. †Cellular blocked: unblocked OK to FCC approved users. All stated specifications are subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. CompuServe is a registered trademark of CompuServe, Incorporated, an H&R Block Company. DAYTON597Y

ICOM

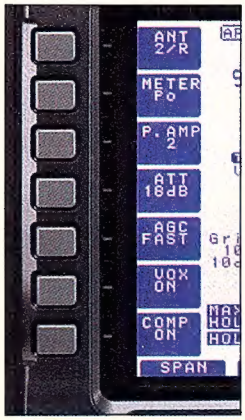
ICOM's IC-756: See and HEAR the Performance

Advanced features, in the spirit of the IC-781.
But at a real down-to-Earth price.

HF+6M!

ICOM uses next generation technology to combine high performance and advanced features in an easy-to-control package: the all new IC-756!

- 4.9" Concentrated Information LCD Display with dot matrix characters
- 5-100 variable-control watts of 100% stable output power (5-40 W on AM)
- All mode: SSB/AM/FM/CW/RTTY
- Built-in automatic antenna tuner with preset 100 kHz steps – works on both RX and TX

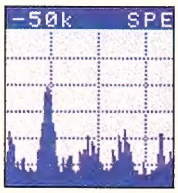


☞ *Large soft key buttons allow for on-screen control of alphanumeric naming, programmable "memo-pad" info, attenuation levels, antenna selection, & more!*

- Dual watch
- Twin passband tuning
- 101 memory channels
- 13.8 volt operation

PC Ready!

Options required for PC programming:
CT-17 CI-V Level Converter, third party serial cable with pins 1-8 & 20



IF-DSP

"It even worked on atmospheric noise, and it did not exhibit that annoying hollow sound we've noticed on some other DSP NR systems."

- Noise Reduction (NR)
- Auto DSP controlled notch filter
- Selectable Audio Peak Filter (APF)
- Phase Shift Network (PSN) modulation/demodulation

"The ability to tweak transmit audio to taste was a real plus. Everyone's voice is different, and this DSP feature bursts through the old 'one size fits all' mentality…."
– QST, May 1997

- Built-in CI-V PC interface
- Noise blanker on/off control
- High-performance memory keyer
- Voice synthesizer (opt. UT-102 req.)

☞ *Use the IC-756's LCD spectrum scope to visually find nearby airwave activity!*

VALUE

Step up to a higher performance rig. The IC-756 is built 100% ICOM reliable, and it's priced only slightly higher than other models with far fewer features.

Call ICOM's brochure hotline today at 425-450-6088 or see the IC-756 at your ICOM dealer!

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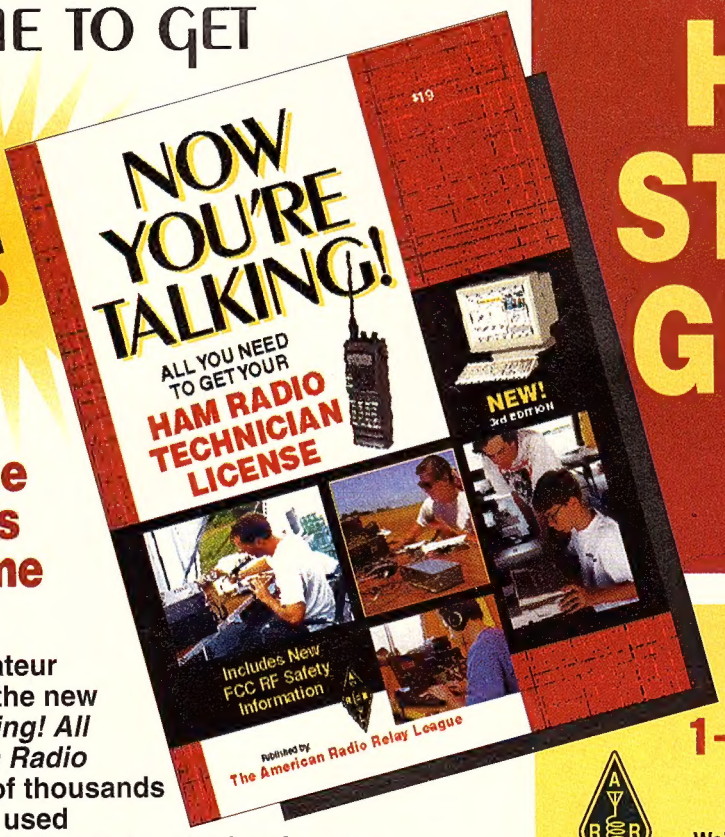
There has NEVER been a better time to get your first Amateur Radio License!

Still $19



Amateur Radio activity is on the increase and it's time to have some fun!

If the goal is your first Amateur Radio license, you'll want the new edition of *Now You're Talking! All You Need to Get Your Ham Radio Technician License*. Tens of thousands of licensed amateurs have used *Now You're Talking!* to study for their entry level exam.

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This edition contains all the new question pool material for exams taken after June 30, 1997.

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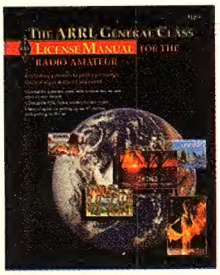

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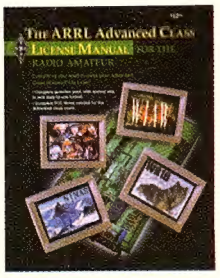

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New, Cool and Blue!

NEW!

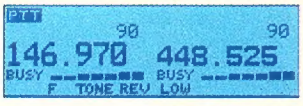
TM-V7A Dual-Band Mobile

Kenwood continues its renowned dual-band mobile tradition with the revolutionary TM-V7A. Large, cool-blue reversible LCD, ergonomic control panel, 280 memory channels, and computer programmability are just some of the many exciting features. Kenwood's engineering expertise, advanced design reputation and outstanding quality are amply evident in the fun-to-operate TM-V7A dual-band mobile transceiver.

- **Alphanumeric memory capability allows you to recall up to 180 memory channels by name. Frequency, memory channel number, and name (up to 7 characters) are displayed simultaneously. Store call signs, repeater names, cities, etc.**

TM-V7A

FM Dual Bander



Performance, quality, and innovation briefly describe the new TM-V7A dual-band mobile. Look at the easy-to-read large blue LCD display! Storing all of your favorite frequencies is a snap with 280 memory channel capacity (alphanumeric to 180). Unique programmable memory function allows you to store virtually all operating data such as frequency, offset, DTSS code, display setting, and beep function in 5 special channels. Visual scan allows you to graphically see band activity near the current operating frequency. Other features include a user-friendly menu and guidance system, 1200/9600 bps packet, AM aircraft band receive, CTCSS, DTSS, paging, backlit DTMF microphone, detachable control panel (with cable option), and voice synthesizer (VS-3 option). The TM-V7A is truly in a class by itself.

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6070 Kestrel Road, Mississauga, Ontario, Canada L5T 1S8

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Fax: 860-594-0259 (24-hour direct line)

Technical

66

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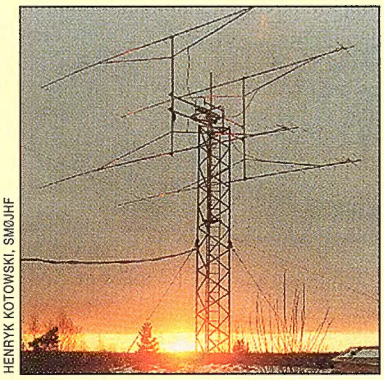
News and Features

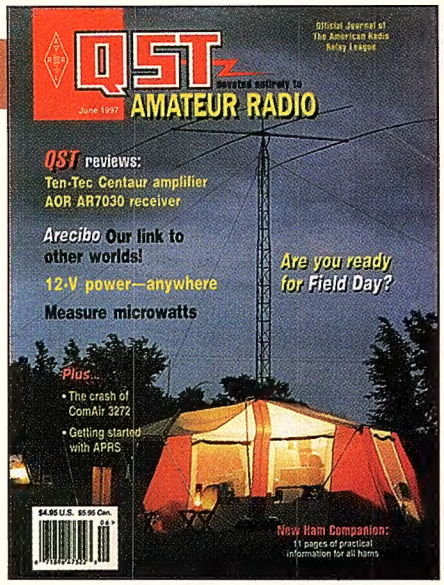
New Ham Companion



HENRYK KOTOWSKI, SM0JHF

Operating

Departments



Our Cover

Summer comes alive with the excitement of Field Day! On June 28 and 29, hams throughout the country will test their abilities to communicate under emergency conditions. For many, this means operating outdoors using various alternative power sources.

At twilight, a tent shelters the 20-meter QRP CW station of the Utica-Shelby Emergency Communications Association in Romeo, Michigan (photo by Eric Bates, KM5D). See more of the WY8M site in "Up Front" in this issue.

Membership in the ARRL, including a subscription to *QST*, is available to individuals at the following rates: $31 per year in the US and possessions, $44 elsewhere, payable in US funds. Age 65 and over, with proof of age, $25 (US only). Licensed radio amateurs age 21 and under may qualify for special rates; write for application. Life Membership is also available. Membership and *QST* cannot be separated. Fifty percent of dues is allocated to *QST*, the balance for membership. Subscription rate for libraries and institutions: $31 per year postpaid in the US and possessions, $44 elsewhere. Single copies $5 in the US.

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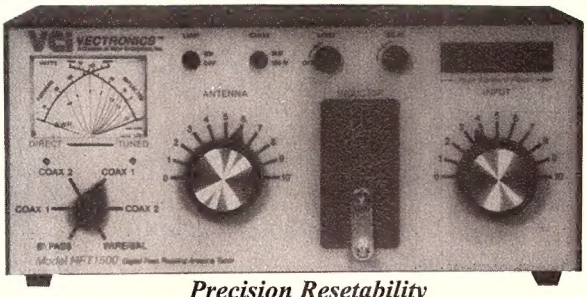
THE VECTRONICS HFT-1500 . . .
THE FINEST HIGH POWER ANTENNA TUNER MADE!

- *high current Roller Inductor*
- *SSB*Analyzer Bargraph™*
- *Cross-Needle Meter*
- *6 position Antenna Switch*
- *built-in 4:1 Balun*
- *gear driven Turns Counter*

HFT-1500
$459.95



The VECTRONICS HFT-1500 is not just an antenna tuner . . . it's a beautifully crafted work of art, using the finest components available and the highest quality construction.

Every HFT-1500 aluminum cabinet is carefully crafted with a durable baked-on paint that won't scratch or chip.

The attractive two-color Lexan front panel is scratch-proof. Take a quarter. Scratch the HFT-1500 front panel as much as you want. *You won't leave a mark!*

Arc-Free Operation

Two *heavy duty* 4.5 kV transmitting variable capacitors and a massive *high current* roller inductor gives you arc-free operation up to 2 kW PEP SSB.

Precision Resetability

A sturdy hand cranked roller inductor lets you quickly *fly* from band to band. A precision 5-digit *gear* driven turns counter lets you accurately return to your previous settings.

Large comfortable knobs and smooth vernier drives on the variable capacitors make tuning precise and easy. Bright red pointers on logging scales make accurate resetability a breeze.

Absolute Minimum SWR

You can tune your SWR down to absolute minimum!

Why? Because *all* three matching network components, the roller inductor and both variable capacitors, are *fully* adjustable.

Tune any Antenna

You can tune any real antenna from 1.8 to 30 MHz, including all MARS and WARC bands. You can tune verticals, dipoles, inverted vees, yagis, quads, long-wires, whips, G5RVs, etc . . .

*SSB*Analyzer Bargraph™*

VECTRONICS' exclusive 21 segment bargraph display lets you visually follow your instantaneous voice peaks. Has level and delay controls.

Accurate SWR/Power Meter

A *shielded* directional coupler and backlit Cross-Needle meter displays *accurate* SWR, forward and reflected power simultaneously. Reads both peak and average power on 300/3000 Watt scales.

6 Position Ceramic Antenna Switch

Select two coax fed antennas (tuned or bypassed), balanced line/wire or bypass.

Built-in Balun

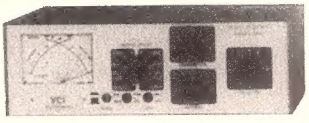
A 4:1 Ruthroff voltage balun feeds dual high voltage Delrin terminal posts for balanced lines. HFT-1500 is 5.5x12.5x12 inches.

Try any product for 30 days

Call toll-free 800-363-2922 and order any product from VECTRONICS. Try it for 30 days. If you're not completely satisfied return it for a full refund, less shipping and handling -- no hassles. All VECTRONICS products come with a one year warranty.

300 Watt Antenna Tuner

VC-300DLP
$159.95



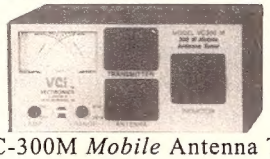
VECTRONICS uses the finest components available to build the highest quality 300 Watt antenna tuner ever made.

You can tune any antenna 1.8-30 MHz. Custom 48 position switched inductor and continuous rotation 1000 Volt capacitors provide arc-free operation. Handles 300 Watts PEP SSB, (150 Watts on 1.8 MHz).

8 position antenna switch, built-in 50 ohm dummy load, peak reading backlit cross-needle SWR Power meter, 4:1 balun for balanced line antenna. Scratch-proof Lexan front panel. 10.2x9.4x3.5 in. Weighs 3.4 lbs.

300 Watt *Mobile* Tuner

VC-300M
$109.95



The VC-300M *Mobile* Antenna Tuner is compact, lightweight, easy-to-operate and is our most economical tuner.

It's compatible with *any* mobile antenna and *any* mobile HF transceiver and is compact enough to fit in the most compact car.

It can also be used at home with dipoles, vees, verticals, beams or quads fed by coax.

Backlit dual movement meter simultaneously monitors Power and SWR. Covers 1.8-30 MHz. Handles 300 Watts SSB PEP, 200 Watts continuous, (150 Watts on 1.8 MHz.). 7.25x8.75x3.6 in. Weighs 3.4 lbs.

SWR/Power Meters

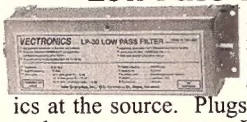
PM-30
$79.95
PM-30UV
$89.95

PM-30, $79.95, for 1.8 to 60 MHz. Displays forward and reflected power and SWR simultaneously on dual movement Cross-Needle Meter. True *shielded* directional coupler assures accuracy. Backlit meter displays peak or average power in 300/3000 Watt ranges. First-rate construction includes scratch-proof case/front panel. 5.3x5.75x3.5 inches. SO-239 connectors.
For 144/220/440 MHz, 30/300 Watt ranges. PM-30UV, $89.95, has SO-239 connectors. PM-30UVN, $89.95, has N connectors. PM-30UVB, $89.95, has BNC connectors.

1500 Watt *dry* Dummy Load

DL-650M, $64.95. Handles 100 watts continuous, 1500 Watts for 10 seconds to 650 MHz. Ceramic resistor. SWR < 1.3. SO-239 connector. **DL-650MN, $69.95** has N connector.

Low Pass TVI Filter



LP-30, $69.95. Eliminates TVI by attenuating harmonics at the source. Plugs between transmitter and antenna or tuner. Handles 1500 watts.

High Pass TVI Filter

HPF-2, $24.95. Installs between VCR/TV and cable TV or antenna lead-in cable. Eliminates or reduces interference caused by nearby HF transmitters.

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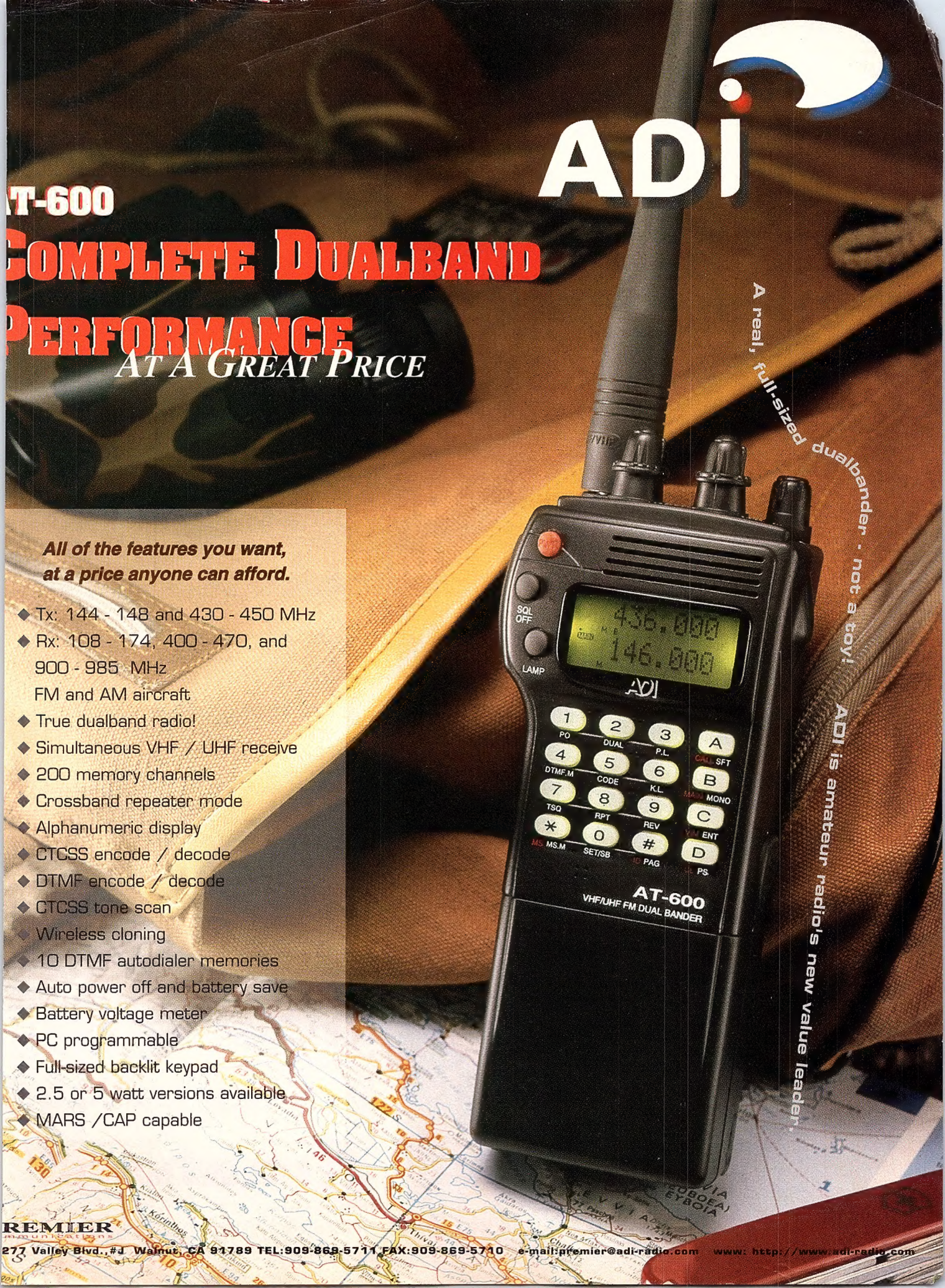
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All of the features you want,
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900 - 985 MHz
FM and AM aircraft
True dualband radio!
Simultaneous VHF / UHF receive
200 memory channels
Crossband repeater mode
Alphanumeric display
CTCSS encode / decode
DTMF encode / decode
CTCSS tone scan
Wireless cloning
10 DTMF autodialer memories
Auto power off and battery save
Battery voltage meter
PC programmable
Full-sized backlit keypad
2.5 or 5 watt versions available
MARS /CAP capable
SQL OFF
LAMP
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146.000
AT-600
VHF/UHF FM DUAL BANDER
REMIER
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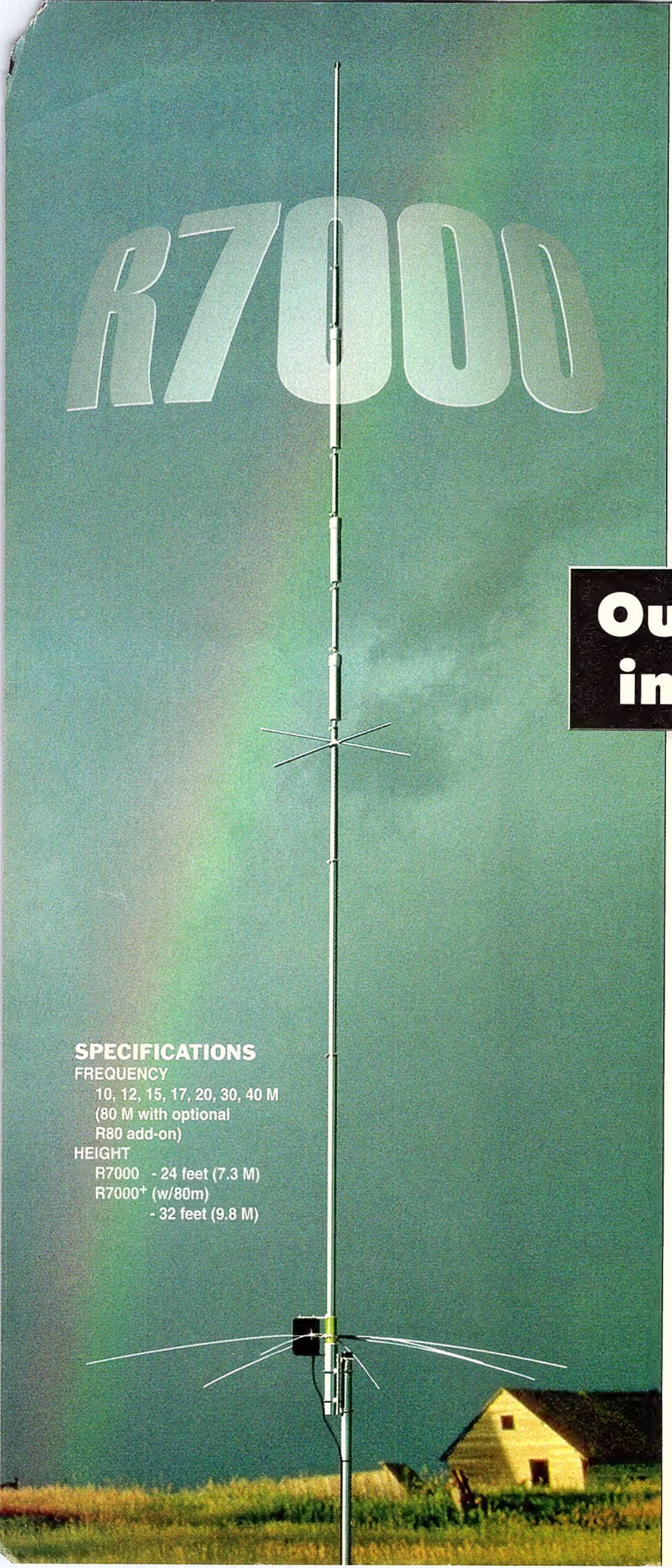

SPECIFICATIONS

FREQUENCY
10, 12, 15, 17, 20, 30, 40 M
(80 M with optional
R80 add-on)

HEIGHT
R7000 - 24 feet (7.3 M)
R7000+ (w/80m)
- 32 feet (9.8 M)

10, 12, 15, 17, 20, 30, 40 Mete

Outstanding Performance, Reliability, and Looks

The Cushcraft R7000 delivers top performance on seven bands in a package ready for home or portable use. The R7000 offers easy assembly, a small footprint, and a "stealthy" appearance in a manageable size. The R7000 is the best choice for all around HF use.

Our customers say it best!

Great Performer

"Making great DX contacts to South America and Europe - in poor propagation conditions. My God what will it be like when conditions improve? . . . can hardly wait . . . will add 80 meters soon. Thank you for an excellent product." N1XAE

Reliable

"The R7000 withstood several New England ice/snow storms with no damage." KA1WIU

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"It Seems to Us..."

A New Tool for Enforcement?

High on the wish lists of most ARRL members is better enforcement of the FCC rules. Working against us in the pursuit of that end is the general desire for less-expensive government, which translates to fewer resources for agencies like the FCC.

The dilemma is not new. It has been 15 years since the League, seeing the handwriting on the wall, secured statutory authority for volunteers to assist the Commission in monitoring for rules violations—because, as the July 1982 *QST* editorial put it, "...the FCC is increasingly unable to solve our problems for us." That authority, contained in Public Law 97-259, gave rise to what is now known as the Amateur Auxiliary to the FCC's Compliance and Information Bureau.

The creation of the Amateur Auxiliary did not cause our problems magically to disappear. Indeed, its history is that of a few successes amid a rising tide of frustration among its volunteers. Gathering evidence of on-the-air violations is unpleasant, difficult, and time-consuming. When volunteers go to all that effort, it is only reasonable that they will expect to see some results. All too often, the FCC has been unable to follow through or has only issued notices of apparent liability for monetary forfeiture, which, for various reasons, are not collected.

Last fall, an ARRL committee chaired by Vice President Joel Harrison, W5ZN, suggested a partial solution. Acting on the committee's recommendation, the Board authorized the filing of a petition to create procedures for the submission to the Chief Administrative Law Judge (ALJ) of private-sector complaints of serious rule violations in the Amateur Service. The petition was filed on March 28.

The League's petition requests that the Commission authorize its Chief ALJ to receive and review complaints from Amateur Auxiliary participants of repeated, willful or malicious interference to the radio communications of a licensed amateur station. The new procedures would reduce the administrative burden that is now placed on the staffs of the Wireless Telecommunications Bureau when the subject of the complaint is an amateur licensee, and the Compliance and Information Bureau when the subject is not a licensee. If the Chief ALJ were to find that a complaint established a *prima facie* case, an order would be issued to the accused to show cause why his or her license should not be revoked or suspended. If the complaint were to be contested, the accused would be entitled to a hearing.

The proposed procedures are modeled on complaint procedures for common carriers, and so have the advantage of not being entirely new and untested. There would be several procedural safeguards against frivolous complaints. Producing *prima facie* evidence of malice is difficult, as it should be; interference *per se* is not illegal, and some among us are too quick to assume malice when the cause of interference is simply a conflict between amateurs having equal right to the use of a particular frequency.

It is, of course, too much to expect that the new procedures, if adopted, will immediately rid us of the scourge of malicious interference. The petition is but a single step. Our task now is to show the Commission why it is a step in the right direction.—*David Sumner, K1ZZ*

WHAT IF THEY GAVE AN AUCTION, AND NOBODY CAME?

Prior to April 25, the FCC had conducted 13 auctions of licenses to use various portions of the radio spectrum for various commercial purposes. Those auctions raised $23 billion for the federal treasury, giving Congress 23 billion reasons to like spectrum auctions.

Little wonder, then, that in the waning days of the 104th Congress last year there was bipartisan support for adding a provision to the Omnibus Consolidated Appropriations Act that mandated an auction, no later than April 1997, of commercial licenses for 2305-2320 and 2345-2360 MHz. At the time, the Congressional Budget Office said the auction could generate as much as $2.9 billion to help balance the budget for the 1997 fiscal year.

The auction was held, just as Congress directed—but the bidders failed to follow the script. After 29 rounds of bidding, the net proceeds for 128 licenses totaled just $13.6 million, a fraction of one percent of the anticipated amount. That's like setting out from New York City with the intention of going to Los Angeles, and making it as far as Newark.

These lines are being written just a couple of days after the announcement of the debacle. The Washington blame game has barely begun; no doubt we'll be hearing a lot more about it in the weeks to come. Does this spell the end of spectrum auctions? That isn't likely; auctions remain a reasonable tool for assigning licenses among mutually exclusive applicants for spectrum that is already allocated for commercial use. What *should* end is the mad rush to identify more spectrum that can be auctioned off to generate revenue. As we said on this page in February 1995, "The surest way to kill the goose that is laying all of those golden eggs is to auction off *too much* spectrum."

In mandating the 2.3 GHz spectrum auction, Congress at least proved the accuracy of those words. Let us hope there is enough wisdom on the Hill to avoid laying any more eggs of this variety.—*David Sumner, K1ZZ*

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Utah	Jim Rudnicki, NZ7T, 306 North 1500 East, Layton, UT 84040 (801-547-9218); e-mail **nz7t@arrl.org**
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Southern Florida	Robert (Rip) Van Winkle, AA4HT, 1413 Covey Cir S, Lakeland, FL 33809 (941-853-1400); e-mail **aa4ht@arrl.org**
Puerto Rico	Guillermo Schwarz, KP3S, HC-03 Box 7526, Guaynabo, PR 00971 (809-720-8137); e-mail **kp3s@arrl.org**
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Southwestern Division

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Los Angeles	Phineas J. Icenbice Jr, W6BF, 19323 Halsted St, Northridge, CA 91324 (818-349-3186); e-mail **w6bf@arrl.org**
Orange	Joe H. Brown, W6UBQ, 5444 La Sierra, Riverside, CA 92505 (909-687-8394); e-mail **w6ubq@arrl.org**
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Oklahoma	Coy C. Day, N5OK, RR1 Box 254, Union City, OK 73090-9726 (405-483-5632); e-mail **n5ok@arrl.org**
South Texas	Alan Cross, WA5UZB, 4714 Coltwood Dr, Spring, TX 77388 (713-350-0322); e-mail **wa5uzb@arrl.org**
West Texas	Amelia "Milly" Wise, W5OVH, 8516 Mt Scott, El Paso, TX 79904 (915-751-4160)

*"ALPHA amplifiers have a world-class reputation for performance and reliability and are used by many of the leading DXpeditions and serious contest entries throughout the world."**

January 1997: VKØIR, Heard Island, South Indian Ocean

It cost the **VKØIR** team $200,000 ***just to get to this most wanted DX country.*** Propagation always is difficult here: "short path" to Tokyo is 7,500 miles, London 8,500 miles, Seattle 12,000 miles.

Operating in the shadow of 9,000 foot volcano "Big Ben", VKØIR makes 80,673 QSOs – from the edge of the world at the bottom of the sunspot cycle! Their amplifiers? The same ***ALPHA/POWER 91βs*** that expedition organizers KK6EK, KØIR and ON6TT took to XRØY in 1995.

RIGHT: January 1994: Powered by four ***ALPHA 89*** amplifiers, **3YØPI** on isolated Peter I Is. Antarctica dished out more than 60,000 QSOs despite ferocious summer blizzards and often-poor propagation.

BELOW: Many hundreds of DXers and contesters, including world-class operators like CT1BOH/P4ØE, N6TJ/ZD8Z, and OH2BH/EA8BH depend on ***the ultimate linear, ALPHA 87A.***

* In RSGB's February 1997 *RadCom*, Peter Hart, G3SJX, provides our headline and says, "(The ***ALPHA/POWER 91β***) is beautifully made... performed flawlessly...is an excellent amplifier in all respects... at a very competitive price... The ***87A*** really is the ultimate linear amplifier...the 'Rolls Royce' of all linear amplifiers.

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More hams use Ameritron AL-811 amplifiers than any other amplifier in the world . . . The AL-811 has earned a worldwide reputation for legendary quality, flawless performance, proven reliability and superb customer service . . .

Ameritron AL-811 linear amplifier gives you plenty of power to bust thru QRM.

You get a quiet desktop linear that's so compact it'll slide right into your operating position -- you'll hardly know it's there . . . until QRM sets in. And you can conveniently plug it into your nearest 120 VAC outlet -- no special wiring needed.

You get three tough 811A transmitting tubes, extra heavy duty power supply, all HF band coverage, pressurized ventilation, tuned input, dual illuminated meters, adjustable ALC and much more . . . for an incredible $649 . . .

At stock dealers everywhere!

The first 600 watts makes the difference

The AL-811 gives you 600 watts PEP output -- that's nearly 2 full S-units over your barefoot rig.

That could mean the difference between hearing, "You're Q-5 armchair copy" and, "Sorry can't copy you, too much QRM."

Now you won't have to stand aside while the "big guns" steal your DX. You'll be able to log some of those stations first.

Going from 600 watts to the full legal limit gives you less than one S-unit increase. But is that fraction of an S-unit worth the 3 to 4 times more money it'll cost you?

The AL-811 gives you a powerful punch at a price that's easy on your wallet.

All band, All mode coverage

The AL-811 covers all HF bands. There's no compromise on WARC and most MARS bands -- you get a 100% rated output.

You can operate the AL-811 on all modes. Get 600 watts output PEP SSB and 500 watts output CW. You even get 400 watts on demanding continuous carrier modes like RTTY, SSTV, FM and AM.

How the low cost 811A tube resists premature failure - - even when your amplifier is mistuned

First, they're constructed with widely spaced elements that minimize the chance of elements touching and causing a short -- even if the plate gets hot enough to melt.

Second, they use a directly heated thoriated tungsten filament cathode that prevents the electron emitting layer from instantly stripping off -- even if mistuning causes a sudden, severe current overload.

The Ameritron AL-811 is excellent for the newcomer because it's tough enough to withstand momentary mistuning. And the tubes are so inexpensive that you can replace one for mere pocket change.

The Ameritron advantage: Extra heavy duty power supply gives you peak performance year after year

The heart of the AL-811 power supply is its heavy duty power transformer with a *high silicon steel* core weighing a hefty 17 pounds.

A full wave bridge using 52.5 ufd of total capacitance (four 210 ufd, 470 volt capacitors) produces 1500 volts under full load and 1700 volts no load. That's excellent high voltage regulation!

Full height computer grade filter capacitors with screw terminals are used -- *not* short stubby, light duty soldered-in ``high technology" capacitors that can't dissipate the heat generated by high current.

The rectifier diodes are rated for a massive surge current of 200 amps. They won't blow even if you accidentally short the high voltage supply.

Wire wound, 7 watt, 50 K ohm equalizing resistors safely protect each filter capacitor -- *not* 2 watt, 100 K ohm carbon composition resistors that can open and cause your filter capacitors to explode or fail.

The Ameritron AL-811 power supply is built tough so you get peak performance year after year.

Tuned input provides excellent load for any rig

A Pi-Network tuned input provides a 50 ohm load for your rig. Even fussy solid state rigs can deliver their full drive to AL-811.

Low loss slug tuned coils -- tunable from the rear panel -- let you optimize performance. High quality low drift silver mica capacitors maintain proper tuning.

Output tank: optimum Q on each band

The low loss pi-network output tank of the AL-811 has been carefully designed for optimum Q on each band and built with quality RF components.

The result is peak performance over each band, wide impedance matching range and exceptionally smooth tuning with efficiencies close to 70%. Even a 3:1 SWR load won't damage the tubes or tank components.

A ball bearing vernier reduction drive makes plate tuning precise and easy.

Quiet pressurized ventilation keeps your tubes safely cooled

A *quiet* blower pressurizes the cabinet with a large volume of air flow. It keeps the 811A tube temperature *well below* the tube manufacturer's rating -- even with a key down carrier at 400 watts output -- without the *overwhelming* noise of oversized fans.

Two illuminated meters

Two illuminated meters give you a clear picture of your AL-811 operating conditions so you can tell right away if something is wrong.

The Grid Current meter *continuously* checks for improper loading. The other meter switches between high voltage and plate current to warn of abnormal conditions.

Ameritron exclusive Adapt-A-Volt™ power transformer

Too high line voltage stresses components and causes them to wear out and fail. Too low line voltage causes a "soft-tube" effect -- low output and signal distortion.

Ameritron's exclusive *Adapt-A-Volt™* power transformer has a special buck-boost winding that lets you compensate for stressful high line voltage and performance robbing low line voltage.

This makes your components last longer and gives you peak performance -- regardless of your line voltage.

Plus more . . .

An Operate/Standby switch lets you run barefoot, but you can instantly switch to full power if needed.

A transmit LED tells you when your rig is keying your AL-811.

A 12 VDC keying relay makes it compatible with all solid state and tube rigs. A built-in back-pulse cancelling diode protects your rig's keying circuit.

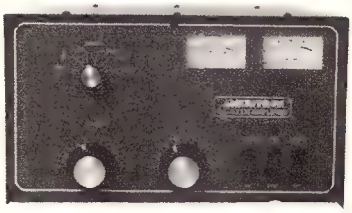
Shielded RF compartment. One year limited warranty. Compact 16" D x 13¾" W X 8" H. 30 pounds. UPS shippable. Shipped with transformer installed and wired for 120 VAC. Draws 8 amps at 120 VAC. Export model AL-811X wired for 240 VAC and includes 10 and 12 meters.

Made in USA

Made in USA. At Ameritron, we don't just ship amplifiers we build them to last.

800 WATTS . . . $795

Ameritron gives you *four* 811A tubes, 800 watts for the *same* price as the competitor's *3* tube 600 watt unit . . . Why settle for *less* power and pay *more* money?



Only the Ameritron AL-811H gives you *four fully neutralized* 811A transmitting tubes. You get absolute stability and superb performance on higher bands that can't be matched by un-neutralized tubes.

Ameritron mounts the 811A tubes *vertically* -- not horizontally -- to prevent hot tube elements from sagging and shorting out. Others, using *potentially damaging horizontal mounting*, require special 811A tubes to retard sagging and shorting.

A *quiet*, powerful computer grade blower draws in plenty of cool air. It pressurizes the cabinet and efficiently cools your 811A tubes. Our air flow is so quiet, you'll hardly know it's there-- unlike noisy, oversized blowers.

You also get efficient full size heavy duty tank coils, full height computer grade capacitors, heavy duty high silicon core power transformer, slug tuned input coils, operate/standby switch, transmit LED, ALC, dual meters, QSK compatibility with QSK-5 plus much more.

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Get 600 watts of real power and the *best value* for your money. Call your favorite dealer for your *best price* and order your AL-811 today.

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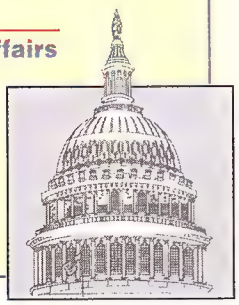
DC Currents

By Steve Mansfield, N1MZA
Manager, Legislative and Public Affairs



Just as radio waves aren't constrained by artificial boundaries, neither is ARRL's government relations effort. *DC Currents* covers behind-the-scenes activity you need to know about in Congress, at the FCC and other regulatory agencies, as well as at world-wide bodies such as the International Telecommunication Union.

Senator Feingold Listens to Amateurs, Modifies CB Bill

♦ Senate bill S 608, introduced by Wisconsin Sen Russell Feingold, would allow local authorities to go after CB radio operators who violate the law by using linear amplifiers. The new bill exempts Amateur Radio operators. Interference caused by high-power CB operation is an increasing nuisance in Wisconsin communities, according to Senator Feingold.

This is the second time around for the bill. Last summer Sen Feingold introduced S 2025, but amateur operators in Wisconsin and elsewhere expressed fear that that it might be used by ill-informed local authorities to harass law abiding hams. While the ARRL felt that the bill wouldn't come out of committee, we took it seriously because some version was absolutely certain to be introduced the next session. We immediately contacted the Senate Commerce Committee, which has jurisdiction over the FCC. The committee called an informational hearing, during which Sen Feingold's staff asked for ARRL suggestions on how to improve the bill for the next session of Congress.

The ARRL had several concerns. We wanted to protect amateurs from overzealous local officials, protect the principle of federal preemption of telecommunication matters, and clear up legal ambiguities in the bill that could ultimately harm Amateur Radio. Following the hearing, ARRL representatives and Sen Feingold's staff began a lengthy process of swapping drafts, comparing language and passing ideas back and forth. Ultimately, Sen Feingold found a way to address the ARRL's major concerns about the bill. He explained how amateurs would be exempted in comments that appeared in the April 9, 1997, *Congressional Record*:

"The American Radio Relay League (ARRL), an organization representing amateur radio operators, frequently referred to as 'ham' operators, raised a number of concerns about that legislation [S 2025]. ARRL was concerned that while the bill was intended to cover only illegal use of CB equipment, FCC-licensed amateur radio operators might inadvertently be targeted and prosecuted by local law enforcement. ARRL also expressed concern that local law enforcement might not have the technical abilities to distinguish between ham stations and CB stations. In addition, they might not be able to determine what CB equipment was FCC-authorized and what equipment is illegal.

"Over the past several months I have worked with the ARRL representatives and amateur operators from Wisconsin to address these concerns. As a result of those discussions, the bill I am introducing today incorporates a number of provisions suggested by the league. First, my legislation makes clear that the limited enforcement authority provided to localities in no way diminishes or affects FCC's exclusive jurisdiction over the regulation of radio. Second, the bill clarifies that possession of an FCC license to operate a radio service for the operation at issue, such as an amateur station, is a complete protection against any local law enforcement action authorized by this bill. Amateur radio enthusiasts are not only individually licensed by FCC, unlike CB operators, but they also self-regulate. The ARRL is very involved in resolving interference concerns both among their own members and between ham operators and residents experiencing problems.

"Third, my legislation also provides for an FCC appeal process by any radio operator who is adversely affected by a local law enforcement action under this bill. FCC will make determinations as to whether the locality acted properly within the limited jurisdiction this legislation provides. FCC will have the power to reverse the action of the locality if local law enforcement acted improperly. And fourth, my legislation requires FCC to provide States and localities with technical guidance on how to determine whether a CB operator is acting within the law."

The Plot Thickens on Liability Reform

• Now that Representative Eshoo has introduced HR 1013, and ARRL members have begun asking their members of Congress to sign on as cosponsors, a wild card has been played in the Senate. Sen Paul Coverdell of Georgia has introduced S 544, the Volunteer Protection Act of 1997. While certainly promising, S 544 is not a substitute for HR 1013.

S 544, if passed, would grant protections from personal civil liability to volunteers working for nonprofit organizations and government entities. That's the good news. The bad news is—it's a big "if."

Traditionally, legislation that grants blanket liability protection to large groups has been opposed by trial lawyers and others who are nervous about legislation that could allow individuals to escape personal responsibility for their actions. By contrast, HR 1013 affects only volunteers participating in statutorily defined programs (the Volunteer Examiner System and the Amateur Auxiliary) under the Communications Act of 1934. It does not exempt them, but, rather, affords them the same protections as government employees who used to perform the functions now performed by volunteers.

Were the new Senate bill to pass, it would protect volunteers acting within the scope of their responsibilities provided they were properly "licensed, certified or authorized by appropriate authorities," and where the activities were within the scope of the volunteer's responsibilities. The act would *not* protect acts caused by willful or criminal misconduct, gross negligence, reckless misconduct, violence, terrorism, hate crimes, sexual offenses, civil rights violations or alcohol or drug intoxication.

In *Congressional Record* remarks that accompanied the introduction of the bill, Kentucky Sen Mitch McConnell said that volunteers face a "sue happy" legal culture with "too many people pointing fingers and too few offering a helping hand." McConnell was an original cosponsor, along with Senators Spencer Abraham of Michigan, Rick Santorum of Pennsylvania and John Ashcroft of Missouri. All are Republicans and are in their first terms, except for McConnell.

The legislative positions passed by ARRL's Board of Directors last October support legislation that would provide more liability protections for all Amateur Radio volunteers.

However, political realists suggest that S 544 faces a daunting uphill battle. While the bill could provide more protection for all types of volunteers, hams shouldn't let the distant prospect of winning the whole enchilada obscure the very real prospect of making a necessary and far less controversial fix to existing legislation through HR 1013. This bill is currently gathering cosponsors and awaiting consideration by the House Commerce Committee. ARRL members are still urged to write their members of Congress to cosponsor HR 1013 (see *QST*, May 1997, page 16, for a sample letter).

Who's on First at FCC?

♦ Three Federal Communications Commission seats up are for grabs. Democrat James Quello steps down in June. Republican Andrew Barrett's seat remains vacant. And Commissioner Rachelle Chong, whose term also expires at the end of June, apparently lacks congressional support and has publicly stated that she's willing to step down as well.

The president nominates FCC commissioners, who are then confirmed by the Senate. The president may appoint up to three members from his own party. Current Republican candidates for the FCC slots include Harold Furchtgott-Roth, chief economist for the Senate Commerce Committee, and William Powell, chief of staff in the Anti-Trust Division of the Justice Department (and, not so coincidentally, son of Gen Colin Powell). The leading Democrat is said to be FCC General Counsel William Kennard. The term of Chairman Reed Hundt, a Democrat, expires at the end of 1998. The term of Commissioner Susan Ness, also a Democrat, expires at the end of 1999.

Time to Review the Bidding

• Many amateurs worry about spectrum auctions and Amateur Radio, so we thought it was time to take a deep breath and review the bidding.

Before the introduction of auctions by the Omnibus Budget Reconciliation Act of 1993 (OBRA), licenses for commercial users of electromagnetic spectrum were awarded on the basis of comparative hearings or lotteries. The Pre-OBRA system had two perceived disadvantages: First, comparative hearings were very expensive and time consuming, with the need for lawyers, witnesses and legal paraphernalia. Lotteries, on the other hand, were said by many to encourage speculation. For example, an unqualified applicant might participate with the hope of being awarded a license that he or she could sell later.

The auction system was created to address those problems, as well as the concern that lucrative licenses are being awarded too cheaply. In fact, that's part of the continuing debate over HDTV spectrum. Opponents of the FCC's announced process ask, "Should broadcasters be awarded an expensive federal 'asset' for nothing?" This has become a political hot potato, as any reader of the newspaper editorial pages will know.

It's important to understand that "spectrum" *per se* is not auctioned. *Licenses* are auctioned. License terms are 5 years for TV, 7 years for broadcast radio, 10 years for everyone else. Licenses are renewable at the end of the license period. A complex process exists to challenge a licensee, if another company wants that license at the end of the period. While some conservative think tanks such as the Heritage Foundation and the Progress and Freedom Foundation have called for the auction of spectrum property rights, licenses are the current commodities on the auction block.

Critics of auctions argue that, because of a desire to balance the federal budget, auctions are being prescribed to raise money rather than as a licensing mechanism. Moreover, there's some evidence that anticipated auction revenues may be inflated. At one recent auction, the "winner" went belly up at least in part because it couldn't pay its auction fee. The fact is, the spectrum auction system is just too new for economists or spectrum managers to evaluate.

Amateurs probably should be concerned about a second criticism: Auctions should not be used as *allocation mechanisms*—a means of earmarking an entire band—but only as a way of assigning license rights to a frequency. Some in Congress believe that the winner of an auction ought to be able to provide whatever service it desires within the assigned frequency band. There is no denying that there is a trend toward much broader definitions of radio services.

Finally, some (including the ARRL) have noted that amateurs and public service users can't be expected to participate in auctions. That is a concern that more and more members of Congress are becoming aware of. As a result, the likelihood of wholesale auction of noncommercial spectrum is becoming increasingly remote. Indeed, the only amateur spectrum so far affected by auction has been a secondary allocation at 2305 to 2310 MHz.

But the issue is far from settled. The wireless frontier is a "brave new world" where cellular, PCS, satellite, paging, wireless data and other technologies are mushrooming faster than anybody can keep track of them. Wall Street is pouring money into telecommunications under the principle of "build it and they will come." Auctions are merely another means of making sure that entrepreneurs have the spectrum they need for the 21st century. The challenge for noncommercial users will be to let them build without stepping on our spectrum.

FCC Chairman Hundt Talks to Congress about Public Safety Needs

• FCC Commissioner Reed Hundt told the House and Senate Appropriations Subcommittees in April that public safety communication has been hampered by the inability of agencies and jurisdictions to communicate with one another because they operate on different frequencies. Hundt suggested that one way to raise money to build shared systems in which many local agencies might participate is to use targeted spectrum auction revenues, which the commission is not currently permitted to do. Hundt echoed the suggestion of the Public Safety Wireless Advisory Committee that money raised in future auctions could be earmarked for public safety, if Congress so desired. The chairman made a special plea for $30 million in extra funds to pay for the relocation of FCC headquarters to the new Portals office space in Southwest Washington. He noted that the FCC is taking measures to cut costs elsewhere, including cutting back the number of FCC field offices from 34 to 16.

Congress May Take Another Look at Spectrum Auctions

• Rumors abound regarding new spectrum legislation to be introduced by Sen John McCain (R-AZ) to create "order and regularity" in future spectrum auctions. The fundamental idea of the draft McCain bill—which the ARRL had not seen as this *QST* issue was going to press—is to establish timelines for the period from the time spectrum is identified for auction and the auction itself. In doing so, it may streamline bidding procedures and space out auctions to preserve values. Some members of Congress have expressed concern about the rush by congressional budgeteers to use auctions to raise federal revenues. Since budget balancing is the biggest game in town right now, this concern won't fade quickly. However, the most recent auction of the 30 MHz mandated by last year's federal budget may have dashed cold water on the auction fever, having raised only about $13.6 million, less than 1 percent of the anticipated $1.8 billion.

HR 1013 Cosponsors as of April 22, 1997

Thomas M. Barrett (D-WI-5th)
Doug Bereuter (R-NE-1st)
Brian Bilbray (R-CA-49th)
Earl Blumenauer (D-OR-3rd)
Rick Boucher (D-VA-9th)
George Brown (D-CA-42nd)
Bud Cramer (D-AL-5th)
Ronald V. Dellums (D-CA-9th)
Nathan Deal (R-GA-9th)
Norman D. Dicks (D-WA-6th)
John D. Dingell (D-MI-16th)
Vernon J. Ehlers (R-MI-3rd)
Phil English (R-PA-21st)
Anna Eshoo (D-CA-14th)
Sam Gejdenson (D-CT-2nd)
Paul E. Gillmor (R-OH-6th)
Jim Greenwood (R-PA-8th)
Steve Horn (R-CA-38th)
Ron Klink (D-PA-4th)
Scott Klug (R-WI-2nd)
John Lewis (D-GA-5th)
Thomas J. Manton (D-NY-7th)
Michael R. McNulty (D-NY-21st)
Jim McCrery (R-LA-4th)
Collin C. Peterson (DFL-MN-7th)
David E. Price (D-NC-4th)
Lynn Rivers (D-MI-13th)
Bart Stupak (D-MI-1st)

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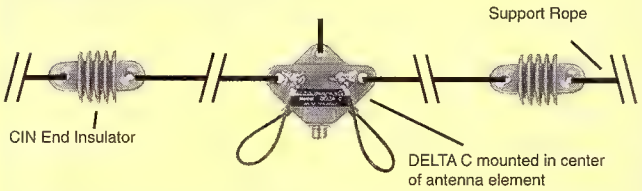
ALPHA DELTA DX Series Monoband Dipoles for Amateur, Commercial and SWL Applications—

Utilizing the Model DELTA-C Center Insulator with the built-in Model SEP Arc-Plug® Static Electricity Protector!



- Model SEP Arc-Plug®Protector is a special gas tube component designed to "bleed off" static electricity that slowly rises on antennas from thunderstorms, wind and even cloudy days. These static charges can damage sensitive components in receivers or transceivers.
- The antennas are fully assembled—not a kit—and includes the Model DELTA-C center insulator, Model CIN End Insulators, support rope and 12GA Insulated high strength solid copper wire. (ALPHA DELTA antennas do not use the smaller 14GA wire found in other brands) The SEP is built-in to the DELTA-C Insulator. The DELTA-C hardware will take either coax or open line feeders.
- For SWL or Commercial applications, any model can be user trimmed to any segment in the spectrum from the model's design frequency thru 30MHz. Formulas and cutting charts are included.
- The antennas are rated for full legal transmit power and therefore are very efficient as receiving antennas. They can be configured as dipoles, inverted - Vs or sloping dipoles.

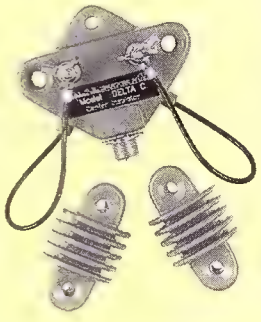
- **Model DX-80.....3.5 MHz.....133 ft. long.....$49.95 ea.**
- **Model DX-40.....7 MHz.....66 ft. long.....$39.95 ea.**
- **Model DX-20.....14 MHz.....33 ft. long.....$39.95 ea.**

ALPHA DELTA—Advancing the Art of the Simple Dipole

Alpha Delta Model DELTA-C • Antenna Hardware Kit

Don't build Your next dipole without one! Designed for convenience and equipment protection with a built-in replaceable Model SEP ARC-PLUG® Static Electricity Protector.

- The SEP protector "bleeds off" slow rising static electricity charges and routes them harmlessly to ground. Far more rugged than DC grounded baluns or chokes, which can be "popped" by static charges.



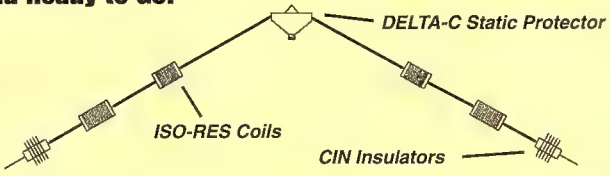
Static charges are developed from thunderstorms, high wind driven snow or desert sand and have been measured to several thousand volts. They can even puncture unterminated coax cable.

- The DELTA-C center insulator and end-insulators are fabricated with an extremely rugged UV and RF resistant material called DELTALLOY. It is so tough you can drop it off a roof with no damage. You no longer need to look for ceramic or glass insulators.
- We use only stainless steel hardware in the center insulator for salt air and other corrosive environments. All internal connections are hard soldered instead of press fit for highest reliability.
- The DELTA-C kit is ideal for dipoles, inverted-Vs, zepps and other wire antennas. It is designed to be fed with either coax or balanced line. The hardware will take either type. It is rated for full transmit power and is also perfect for all kinds of SWL receive antenna applications.

Alpha Delta Model DELTA-C antenna hardware kit includes: center insulator, 2 end-insulators, and Model SEP ARC-PLUG® Static Electricity Protector.
Alpha Delta Model DELTA-C antenna hardware kit.....$29.95 ea.

Separate **Model DELTA-CIN** end-insulators (10 piece min. for direct orders)
Model DELTA-CIN end-insulators.....$1.00 ea.

Introducing the Model DX-LB Low Band Dipole Antenna -- Covering 160-80-40 meters with An Overall Length of Only 100 ft. Fully Assembled and Ready to Go!



- Antenna performance and 2:1 VSWR bandwidth is site dependent and varies with height above ground and surrounding objects. The typical bandwidth of the Model DX-LB is:

160 meters ---------- 20 KHz
80 meters ---------- 40 KHz
40 meters ---------- 300 KHz

For full band coverage, simply feed the DX-LB through an antenna tuner.

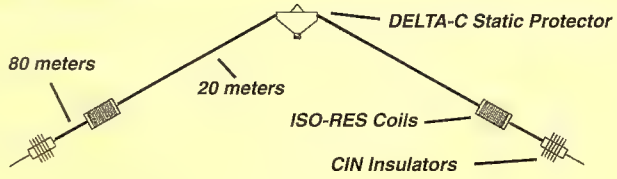
- The DX-LB uses the Model DELTA-C static protected center insulator. The antenna can be fed with either coax or open line feeders.
- The antenna is built with insulated 12 GA. wire and stainless steel hardware. Ready to go out of the box. Can be configured as a dipole or inverted-V.

Model DX-LB 160-80-40 meter low band dipole.....$119.95 ea.

Model DX-LB PLUS
Same as above but also covers 20-15-10 meters.....$149.95 ea.

A Short Dipole • Only 38' Long!

That covers 80 And 20 meters with the efficiency to work DX on both bands while running QRP! We've Done It.



IMAGINE NO LONGER - THE MODEL DX-SD IS IT!

- Antenna performance and 2:1 VSWR bandwith is site dependent and varies with height above the ground and surrounding objects. The typical bandwidth of Model DX-SD is: 20 meters - 300 kHz

  80 meters - 20 kHz: Since the antenna is very short on 80 meters, it must be operated in its 20 kHz range to maintain peak efficiency. The 80 meter wires are easily user trimmed anywhere from 3500 to 4000 kHz. A tuner can be used to broaden it to about 50kHz.

- The DX-SD uses the Model Delta-C static protected center insulator and can be fed with either coax or open wire line.
- The antenna is built with insulated 12 GA. wire and stainless steel hardware. Fully assembled. Handles full power.

Model DX-SD 80-20 meter short dipole.....$99.95 ea.

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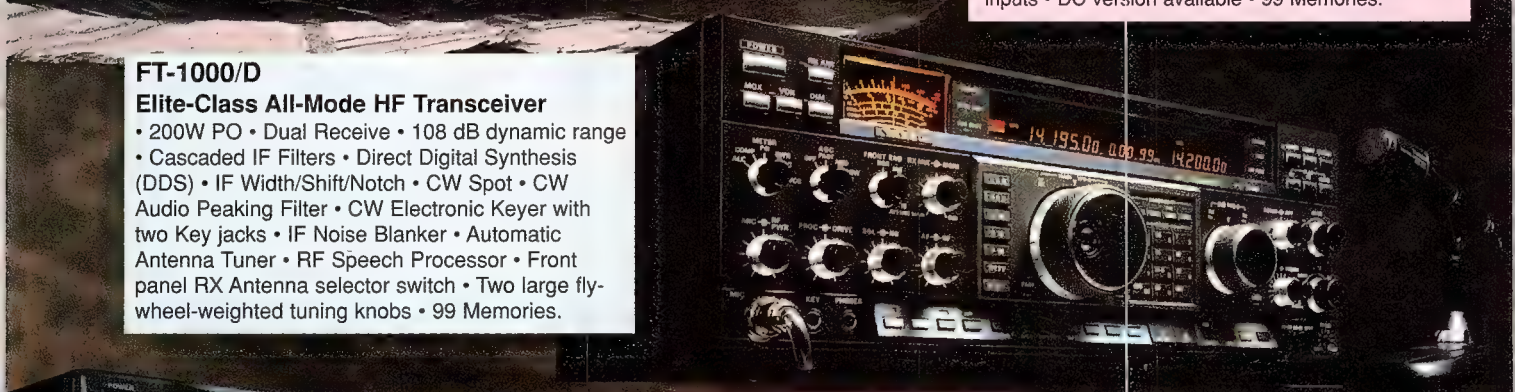
FT-1000/D
Elite-Class All-Mode HF Transceiver

• 200W PO • Dual Receive • 108 dB dynamic range • Cascaded IF Filters • Direct Digital Synthesis (DDS) • IF Width/Shift/Notch • CW Spot • CW Audio Peaking Filter • CW Electronic Keyer with two Key jacks • IF Noise Blanker • Automatic Antenna Tuner • RF Speech Processor • Front panel RX Antenna selector switch • Two large fly-wheel-weighted tuning knobs • 99 Memories.



FT-920
All-Mode HF/6m Transceiver

• High-Performance 33MIPS* DSP • HF + 50 MHz w/100 Watts-all Bands • MOSFET PA Finals • High Speed Auto Antenna Tuner (works on RX & TX) • Omni-Glow™ Dual Display • Twin VFO Knobs • FET RF Amplifier for High & Low Bands • Digital Voice Memory System • Quick Memory Bank (QMB)Frequency System • 127 Memories. *Million Instructions Per Second

FT-900C/AT
Deluxe Compact HF Transceiver

• Detachable Front Panel Design • 100W PO • Built-in Collins® SSB Mechanical Filter • Automatic Antenna Tuner • IF Shift/Notch • Keypad Frequency Entry • Duct Flow Cooling System • Digital Metering • Adjustable CTCSS Tones • 100 Memories.

FT-840
High Performance Compact HF Transceiver

• High Receiver Dynamic Range • Dual Band Stacking VFOs with Direct Digital Synthesis (DDS) • 100W PO • IF Shift • IF Noise Blanker • Digital Mode Interface • CW-Reverse feature • Adjustable Repeater CTCSS Tones • Optional (External) Automatic Antenna Tuner • 100 Memories.

FT-600
Multi-Purpose HF SSB Transceiver

Frequency Range: RX: 50 kHz - 30 MHz; TX: 160-10M • 100W PO • MIL-STD 810 Rating • Alphanumeric Omni-Glow™ LCD Display • Keypad Frequency Entry • Optional CW (500 Hz) and AM (6 kHz) filters available • Dual Watch • Front-mounted Speaker with High Audio Output • PC Programmable • 100 Memories (in 4 banks of 25).

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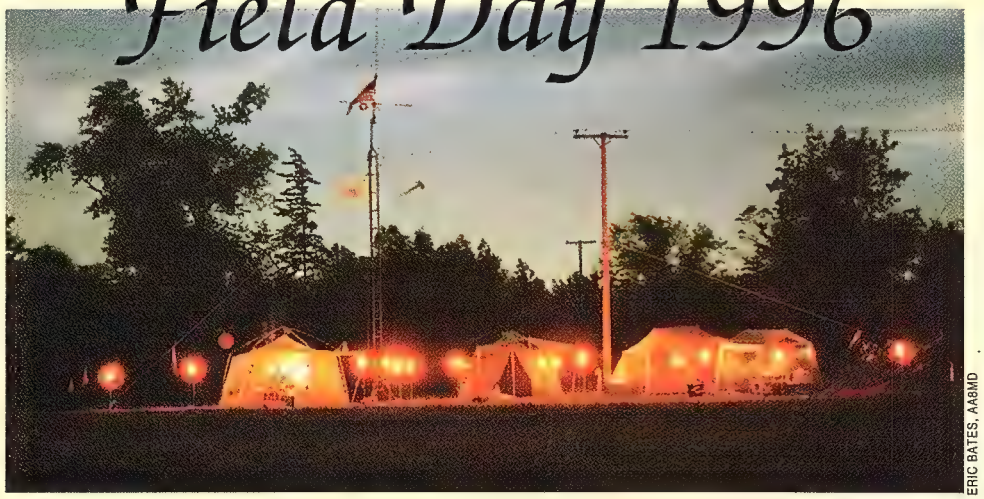
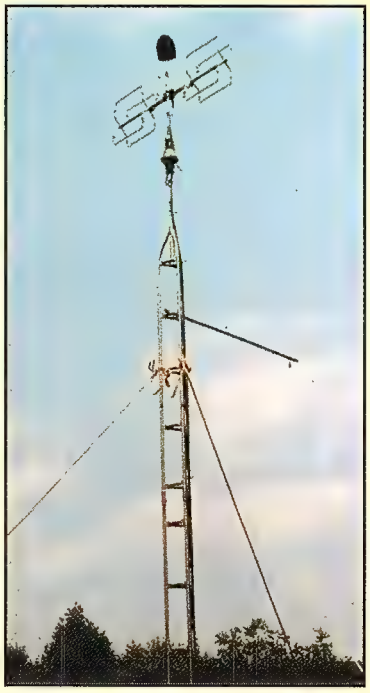


ERIC BATES, AA8MD

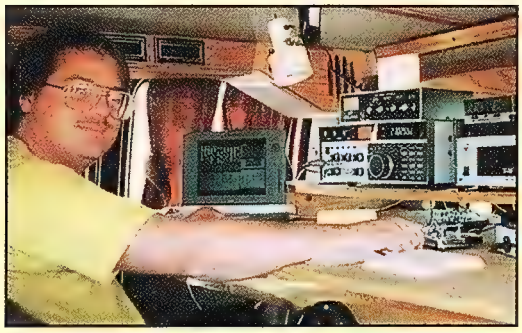
At the WY8M QRP FD effort in Michigan, a ring of Citronella torches protected the ops from flying critters.



CHARLES DOTSON, WB8NSL

The WB8NSL group led in 1A for West Virginia, improvising with a spade handle to replace a missing mast for the VHF antenna. They claim "It was great for digging through pileups!"

FRIED HEYN, WA6WZO

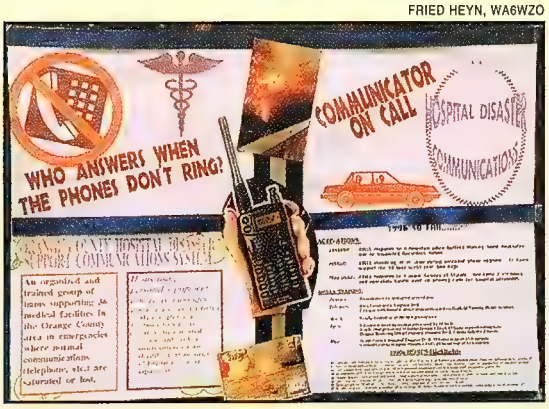


At the United RA, K6AA, N7KFL is snug and well-equipped in his conversion van–mounted station.

FRIED HEYN, WA6WZO

At W6KA, the Pasadena RC's FD station, Phil, KE6PMZ, seems to be having *too* much fun. Was he perhaps reading jokes off the Internet, rather than making contacts?

FRIED HEYN, WA6WZO



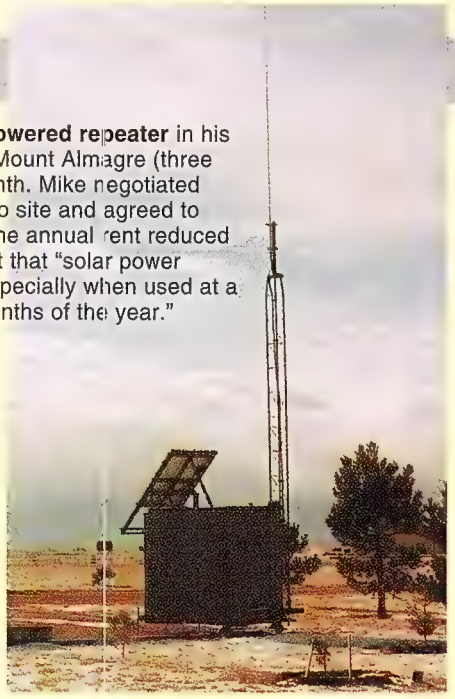
ANTHONY ROSSANO, KE4FFY

Don't forget to show a good face to the visiting public—*plus* you get bonus FD points for doing so! On the left, the excellent sign used on FD by the Orange County Hospital Disaster Support Communication System, K6EW. On the right, the banner of the Macon ARS, W4BKM, in Georgia, which they use for various public events.

KEVIN SCOTT, WB4BNU

Kevin, WB4BNU, was doing some antenna work and temporarily took his transceiver outdoors to make some SWR measurements at the base of the antenna. Kevin put the rig on his son's play table. You guessed it—the next thing Kevin knew, 21-month-old Kyle was twiddling the knobs and switches on the radio! Kevin says that Kyle also enjoys "playing at the computer keyboard, and he knows how to turn on and off almost every electronic gadget in the house."

Mike, AAØSP, is testing a solar-powered repeater in his driveway, with plans to install it on Mount Almagre (three miles south of Pike's Peak) this month. Mike negotiated with the manager of the mountaintop site and agreed to use solar power—in order to have the annual rent reduced from $3600 to $500. Mike points out that "solar power presents many unique problems, especially when used at a site that is inaccessible for eight months of the year."



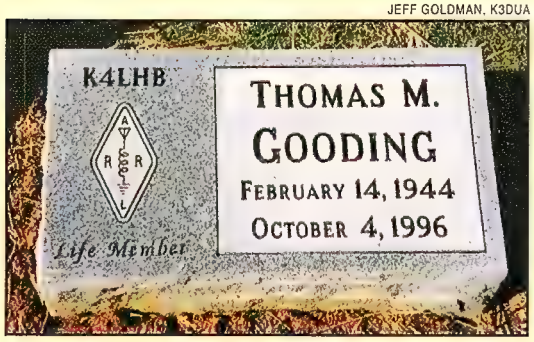
MIKE BERNSTEIN, AAØSP

Ted, G6HMS, and Andy, DC2BB, recently made two-way radio contact via the Japanese FO-29 satellite. Ted notes that "Unlike voice transmission, where the ear can compensate for the Doppler-induced frequency movement, tuning of the computer-decoded SSTV signals is far more critical, as the gray scales change with Doppler." The two hams transmitted a constant uplink signal throughout the pass, and continually tuned their receivers to compensate for the Doppler shift on the downlink. The contact was made on December 26, 1996, when FO-29 was in the analog mode.

WALLY GIFFEN, W8IYE

Wally, W8IYE, credits a visit to the shack of Hassall, W1LTW (SK), in 1950 with starting him on the path to a ham license. Hassall's survivors acknowledged his commitment to Amateur Radio with his memorial stone.

JEFF GOLDMAN, K3DUA

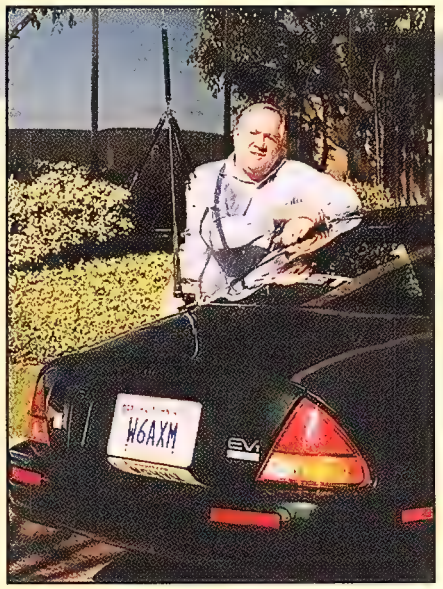


Thom, K4LHB, was attending a Pack-Rat VHF Conference in Horsham, Pennsylvania, last October when he was killed in a pedestrian-automobile accident. His survivors chose to commemorate his long involvement in Amateur Radio with a headstone that notes his life membership in the League.

BILL MANLEY, KB4XE

The co-hosts of the APRS Forum at this year's Miami Hamboree were Bob, WB4APR; Keith, WU2Z; and Steve, K4HG (ex-KO4HD). Bob is the author of the *Automatic Packet Reporting System* for DOS; Keith authored *MacAprs* and *WinAprs*, which perform the same APRS functionality for Macintosh and *Windows 95* platforms, respectively; and Steve provides a JAVA interface for APRS functionality via the World Wide Web. In this photo of the forum, Bob is standing at the far right and Keith is seated at the laptop.

NCG/COMET



Gar, W6AXM, has a slick-looking mobile setup. Wait a minute! What does that nameplate to the right of the license tag say? "EV1 electric"? Gar has what may be the first electric-vehicle HF mobile. General Motors introduced their electric car on December 6, 1996; it's not yet offered for sale, but Gar leased one. He negotiated the terms of the lease to allow installation of a radio, but only if no holes were drilled (inside or out) and if the only electrical connection was via the existing 5 A accessory connector. Although all the body panels are nonmetallic, a look into the trunk showed that the rear internal structure of the car was sheet aluminum. So—if he could attach an antenna mount to the trunk lid—he would have a suitable counterpoise. After a lot of planning and modification of mounting components to clamp onto the trunk of the aerodynamically slick body, Gar was finally able to mount a Comet HA-4S four-band HF antenna on the trunk deck, using a Comet RS-820 mount. The antenna must work pretty well—Gar routinely works QRP mobile, with solid contacts. Gar gets 120 miles to the electrical energy equivalent of a gallon of gasoline. Unless there is a contest in progress.

LARRY MURDOCH, K6AAW

Larry, K6AAW, enjoys the challenge of doing things "the hard way"—like many other hams, past and present. Larry decided to work DXCC by working and confirming contacts with stations with the "DX" suffix (eg, VC1DX, 4Z4DX, YU1DX). Although he has been working DX (or perhaps we should say DXes) since 1952, he only last year received his 100th confirmation. He points out that getting the 100 confirmations was a big task because of "how hard it is to get QSLs these days." Larry has worked 133 DX-suffixed stations to date.

Hisao, JA1OYD, doesn't let apartment living slow down his ham activities. He runs an ICOM transceiver and uses a 12-foot radiator on a fishing pole with a big loading coil. The certificate he's holding is a WAC award.

Steve, N2UE, sent us this beautiful stamp. At first glance, you may wonder what's hammy about it. The stamp, issued by the French Antarctic Territories, shows the M/V *Marion DuFresne.* You still don't see the connection? The *Marion DuFresne* is the ship that carried the VKØIR DXpeditioners to Heard Island, making their great performance possible! The stamp, incidentally, is one of the largest stamps ever issued—4¼ by 1¾ inches.

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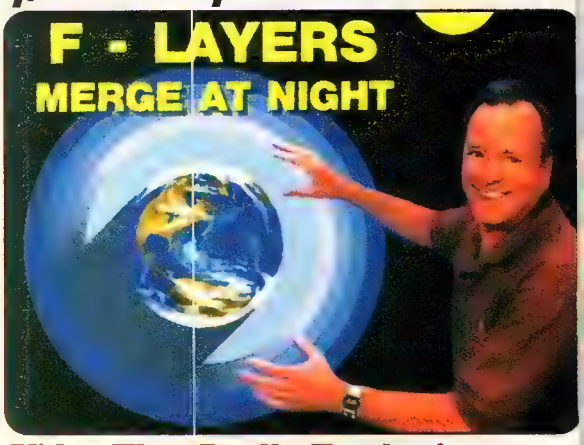

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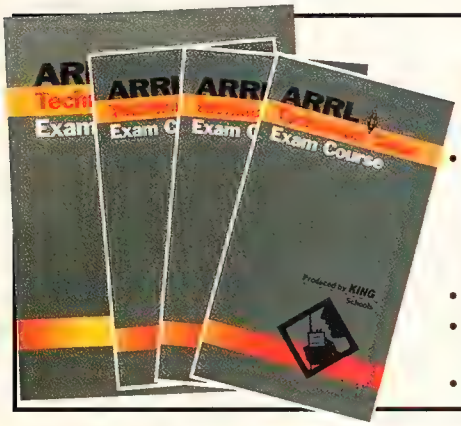

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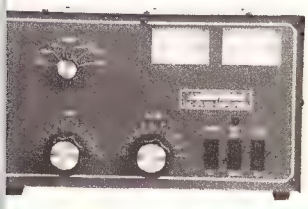

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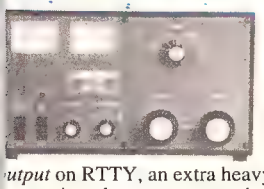
Kilowatt AL-80B doubles average SSB power



AL-80B
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The AL-80B kilowatt desktop linear can *double* your *average* SSB power output with high-level RF processing -- runs cooler because its 3-500Z completely turns off between words. It saves hundreds of watts wasted as heat.

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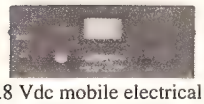
Ameritron ALS-500M Mobile no tune Solid State Amp has 500W out, covers 1.5-22 MHz



ALS-500M
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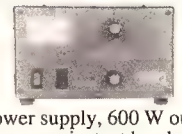
Ameritron ALS-600 no tune Solid State FET amp includes heavy duty power supply, 600 Watts out



ALS-600
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No tuning, no fuss, no worries -- just turn it on and operate. *Includes* AC power supply, 600 W output, continuous 1.5-22 MHz coverage, instant bandswitching, *fully* SWR protected, extremely quiet, very compact. Amp is 6x9½x12 inches.

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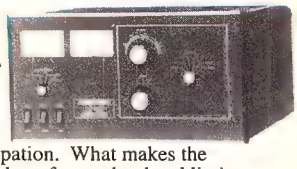

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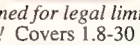
ATR-15 Legal Limit Antenna Tuner . . . $399



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ARB-700 amp-to-radio interface . . . $29.95

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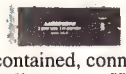

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REVISITING HEARD ISLAND

♦ As I read the editorial in the April *QST* ("It Seems to Us," page 9), I found myself getting more and more upset. It's not that I dislike DXers or DXpeditions, although I haven't involved myself much in that aspect of the hobby. No, what concerned me was the idea that the Heard Island DXpedition was supposed to be some sort of defining moment in Amateur Radio—the ultimate experience.

I certainly appreciated the hardships the VKØIR group encountered. As I read the accolades, the difficulty getting corporate sponsors, the time, effort and risk, the camaraderie, and so on, it sounded very much like the efforts of many volunteer organizations I have known. Most of these organizations serve a humanitarian purpose. They shelter homeless people, heal sick people, improve standards of living, protect the environment, etc. In the midst of these activities, they also are competing for funding and scarce human resources. In contrast, what is the purpose of a DXpedition? To travel to an obscure location and work as many stations as possible! If this is the "magic" of ham radio, I must be in the wrong hobby.

Amateur Radio does a lot of useful things of which I am proud. It is also a diverse hobby with interests for many people. But the magnitude of the Heard Island expedition, compared to its true value to civilization, and compared to other critical issues in our hobby, left me wondering if it deserved the lavish praise which *QST* gave it. Maybe we should rethink our priorities.—*Wilton Helm, WT6C, Newbury Park, California*

♦ The VKØIR Heard Island DXpedition was an exhilarating experience for *everyone*—big-gun stations and little pistols alike. My experience proved this to be true, thanks to the superb VKØIR operators.

I'll never know who was actually at the key, but he spent a precious four minutes patiently digging my faint call sign out of the noise and interference at the bottom of a 30-meter pileup. I think he somehow knew how much the contact meant to me. Despite all the other signals eagerly vying for his attention, he continued to politely insist, "QRZ? WB2F?? DE VKØIR."

His simple courtesy, and the ultimate joy of completing the contact, are refreshing reminders of why I became a ham 25 years ago. As I entered the contact into my log I added, "Good op. Stayed with me."—*Michael J. Moran, WB2FUV, Gardiner, New York*

HAM ACTIVITY IN DECLINE

♦ I think that the decline in Amateur Radio activity is due to a set of factors operating in the world community. A partial list includes:

1. A decline in the faith that individuals can invent new technology and develop commercially useful products. In the past many hams used Amateur Radio as a research and development lab. Now, many people say inventing is for corporations only. This attitude has been encouraged by employment contracts that claim all inventions made by the employee including inventions made on his own time.

2. Ham radio equipment is less operator dependent than it used to be. The old gear required the operator to interact with it a lot to make QSOs. The new gear does not make the same demand on operator skill.

3. The new gear does not offer as much opportunity for modifications and design changes as the old gear did. These "mods" made the old gear more personal and a point of pride.

4. Restrictive covenants, zoning, and now RF exposure regulations limit the opportunity for effective ham radio operation.

5. New housing patterns without barns, outbuildings, and sheds reduce the possible locations for "ham shacks."

6. Smaller lots reduce the space available for antennas and antenna experimenting.

7. Constant media hype that cellular telephones and the Internet are modern and that CW is old fashioned.

8. Two-wage-earner families with little free time after work, child care, and commuting.

9. Declining real family income. One wage earner used to be able to support a family, house, and car(s).

10. Individual components replaced by integrated circuits. Reduced interest in a homebrewing environment of linking IC black boxes.

We should not give up hope about ham radio. However, it is going to be an uphill fight against all of these factors.—*Nick Leggett, N3NL, Reston, Virginia*

TOO MUCH DOOM AND GLOOM?

♦ I subscribe to numerous Amateur Radio magazines and newsletters. Lately, all they want to discuss is our impending demise. Well, they can chalk me up as a ham who has lost interest in the topic. Ham radio is supposed to be my *hobby*; my escape from the real world. If I want doom and gloom I can drive my city's streets, I can watch the news, I can listen to talk radio and so on. If I can't enjoy my hobby without getting my nerves in an uproar, what's the point? We need to calm down and put things in perspective.

The latest catastrophe on the horizon, so they say, is the Internet. We're being told that this new communications medium has made ham radio obsolete. After all, the Internet is extremely reliable and, aside from the cost of the computer itself, relatively inexpensive. But if this is true, why didn't telephones make Amateur Radio obsolete? They are even more reliable and cost effective! I can use a telephone to communicate with just about anyone on the globe, in real time, and full duplex. When I'm not at home, I can use my cellular telephone, which I got for free when I signed up with my local service. I have called in sick to work from a bar stool in Ensanada, Mexico, and I've received calls from the rear seat of a bass boat. If I don't have a telephone, I can seek out the nearest public pay phone. If I want to call long distance, I can buy a prepaid phone card at just about any convenience store.

But Amateur Radio is about none of this—it is the exploration of *radio itself.* It is about building new antennas and trying new modes of propagation. It is about understanding electronics and putting that knowledge to work building and repairing equipment. (How many telephone users understand the devices they hold in their hands, much less the networks they're connected to?) It is about communicating with people at random, not knowing who might answer your CQ, or where they might be located. It is about providing communications in emergency situations. It is about sharing all of the above with people who share a common interest in *radio.*

I fail to see how Amateur Radio is in competition with the Internet any more than I can see how we're going head-to-head with television, newspapers, telephones or the Postal Service. Public-service activities notwithstanding, hamming is primarily a leisure activity. It is not a wireless telephone service or Internet link. If you are interested in radio for radio's sake, then Amateur Radio is the hobby for you. If not, you should reexamine why you became a ham, or possibly try a different hobby.—*Ken Gilcrest, AB7KT, Pahrump, Nevada*

BREAKING IN NEW COAX

♦ Thanks for the article about this important method for preconditioning coax

("Tips on How to Break in New Coax," April 1997 *QST*). I've been doing it for years. However, rather than aligning the outer shield against a tree as shown in the article, I hook my coax to two pickup trucks and let them work against each other. The added benefit is that I can buy 75 feet of coax and make it stretch to 100 feet, saving a lot of money. One more hint: When taking the temperature of coax, always use one of the new armpit thermometers. They are more accurate than the conventional units. It's great to be on the leading edge!—*Ron Faulkner W6TUR, San Diego, California*

♦ The great thing about past April *QSTs* (and their traditional April Fool articles) was the "gotcha" effect on the gullible. So now we go ahead and tip 'em off beforehand in the "This Month in Amateur Radio" section of the magazine? Not quite a Rettysnitch offense, but what gives? Are we afraid the poor dears will ruin $22.50 of the stuff they call coax these days?

The stretching treatment K3YWY is giving his coax in the picture wouldn't hurt "real" coax, now would it? Besides, the readers most likely to be tricked by this article would probably ask their Elmers to do it for them, which would be perfect! A good laugh and an "oops!" never hurt anyone; it always seemed a rite of passage to me.

And I know this article went through the wringer at Headquarters before the "responsible" editors overwhelmed the let's-put-it-in-without-a-warning crew. Wish I could have been there for that discussion!

But all tongue-in-cheek griping aside, I want to thank the ARRL for being a terrific organization—and for publishing a great magazine like *QST*. Next April, don't go so easy on the gullible. They need their annual wake-up call.—*Ray Day, N6HE, Rancho Palos Verdes, California*

UPDATE YOUR ADDRESS

♦ In preparing for our upcoming hamfest, we discovered that an alarming number of hams are not updating their correct addresses with the FCC when they move. Not only is this required by FCC rules, it makes it difficult for you to receive mail such as QSL cards and hamfest flyers. When the outdated address isn't corrected in the FCC database, the erroneous information "propagates" into all of the other call sign databases as well.

The problem is particularly serious for ham clubs. Many clubs use Third Class postage to mail their hamfest flyers. But when the flyers are sent to wrong addresses, they just get thrown away because the Postal Service does not forward Third Class mail. The postage spent to send the flyers is wasted.

In addition to incorrect addresses, it is also important to keep the number of Silent Keys in the FCC database to a minimum. If you know that a ham has passed on, and you know the family, ask them to notify the FCC so the deceased person's call can be removed.—*Ron Hughes, KB5UVC, Altus, Oklahoma*

THANKS, TEXAS UTILITIES!

♦ In the pages of *QST* we're continually advised to work with our local utility companies when power-line noise becomes a problem. This is exactly what I did—with gratifying results.

Several years ago, 138-kV power lines were installed behind my home with a corner tower about 125 feet from my HF beam and tower. The lines went to a power substation about a mile away. Soon after the installation was completed, I experienced a constant 10 over S9 noise level on 20 meters and, to a lesser degree, the same noise on 40, 80 and 160 meters. The noise level peaked when my HF beam was pointed directly at the corner tower. The noise disappeared when the lines were icy or wet.

I notified Texas Utilities and they installed hardware to minimize noise on several nearby high-voltage towers. This did not help and their conclusion was that I was so close to the corner tower that I was in a "corona effect" and there was nothing further they could do.

Recently, the noise increased in intensity and I called TU again. The results were much different this time. The electric company technician, who also holds an Advanced license, told me that he could not hear the signal on the VHF gear they normally use to track down noise generated in the television bands. He correctly deduced that the source could be located using an HF transceiver tuned to 20 meters and a vertical mobile antenna.

By driving along the power lines he found that the noise was coming from inside a power substation! Once inside the substation, he discovered that the noise was coming from a mercury vapor light cover which was positioned between two 138-kV buss bars. Apparently, the contractor who built the facility had failed to properly bond the light cover to the metal pole. A ground strap was installed and the noise vanished.

According to the technician, a voltage was being induced into the ungrounded light cover. This resulted in arcing to the pole which just happened to be about the height of a quarter-wavelength 20-meter antenna. The spark gap signal was being received by the power line and traveling back to the corner tower where it was "broadcast," most likely by the guy wires attached to the tower. He said that it is not uncommon for RF noise to appear to be coming from a corner tower when the source is actually miles away.

At his request, I have not included the technician's name in this letter. But, I very much appreciate the work that he and other Texas Utilities employees did to cure the noise. If you run into a similar problem, it pays to contact your local utility right away. With a little cooperation on both sides, you can resolve the matter to everyone's satisfaction.—*Olin L. Gary, WB5RJK, Arlington, Texas*

QST

This Month in Amateur Radio

Two of the most popular on-the-air events of the year occur in the sunny weeks of June!

The **ARRL June VHF QSO Party** will light up the bands above 50 MHz on the weekend of the 14th. See your May *QST*, page 111, for complete rules. This is an excellent contest for the great outdoors. Take your VHF, UHF or microwave gear and seek out the highest mountains, hills or rooftops you can find. Not only will you have a blast, it's superb preparation for...

Field Day, June 28 and 29! With a little creativity, you can make Field Day an event for the *entire family*, hams and nonhams alike. Even if it means nothing more than pitching a tent in your backyard and enjoying a barbecue between turns on the radio, you'll be making treasured memories for everyone involved. Check out the Field Day rules on page 109 of your May *QST*.

The AB6MF group turns off their Field Day radios long enough to enjoy an evening barbecue.

But you don't have to wait for Field Day to bag that rare West Virginian contact. Just make sure you're on the air June 15 during the **West Virginia QSO Party**. On the following weekend, head up to 6 meters for the **SMIRK QSO Party**, June 21 and 22. "Contest Corral" in this issue has the details.

In the midst off all these contests and QSO parties, don't neglect dear old Dad. **Father's Day** is June 15 this year and the Laurel (Maryland) Amateur Radio Club is honoring patriarchs everywhere with a special-event station—W3*DAD*. Listen for them between 1200 and 0000 UTC on 75, 40, 20 and 10 meters. Nearby, the Frederick ARC celebrates Father's Day by holding their annual ARRL-approved hamfest (see the "Hamfest Calendar" in this issue for details).

June is a hot convention month, with three big gatherings in the South and another in the Northwest.

The **Texas State Convention** has dibs on the first full weekend of the month, June 6 through 8, in Arlington, Texas (a suburb of Dallas, for you-all Yankees). The Arlington Convention Center is just across the street from Six Flags Over Texas.

If the following weekend (June 13 and 14) finds you in Georgia, cruise over to Albany for the **Georgia *Section* Convention**. It's the 15th year for this popular hamfest and computer show.

The big **Georgia *State* Convention** fires up June 21 and 22 in Hotlanta. Don't worry, no hamfest in Atlanta would be complete without an air-conditioned flea market! This show is a *big* draw, so make your reservations now.

Check out the Atlanta HamFestival (Georgia State Convention) Web site at **http://www.saf.com/arc/atlfest.htm**.

A hamfest in a cooler climate might be more to your liking. If so, you need to be in Seaside, Oregon, for the **Northwestern Division Convention**, June 13 though 15.

"Coming Conventions" in this issue has all the information you'll need on these events and more!

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C288A

C188A 2 Meters The Slim-Line HT

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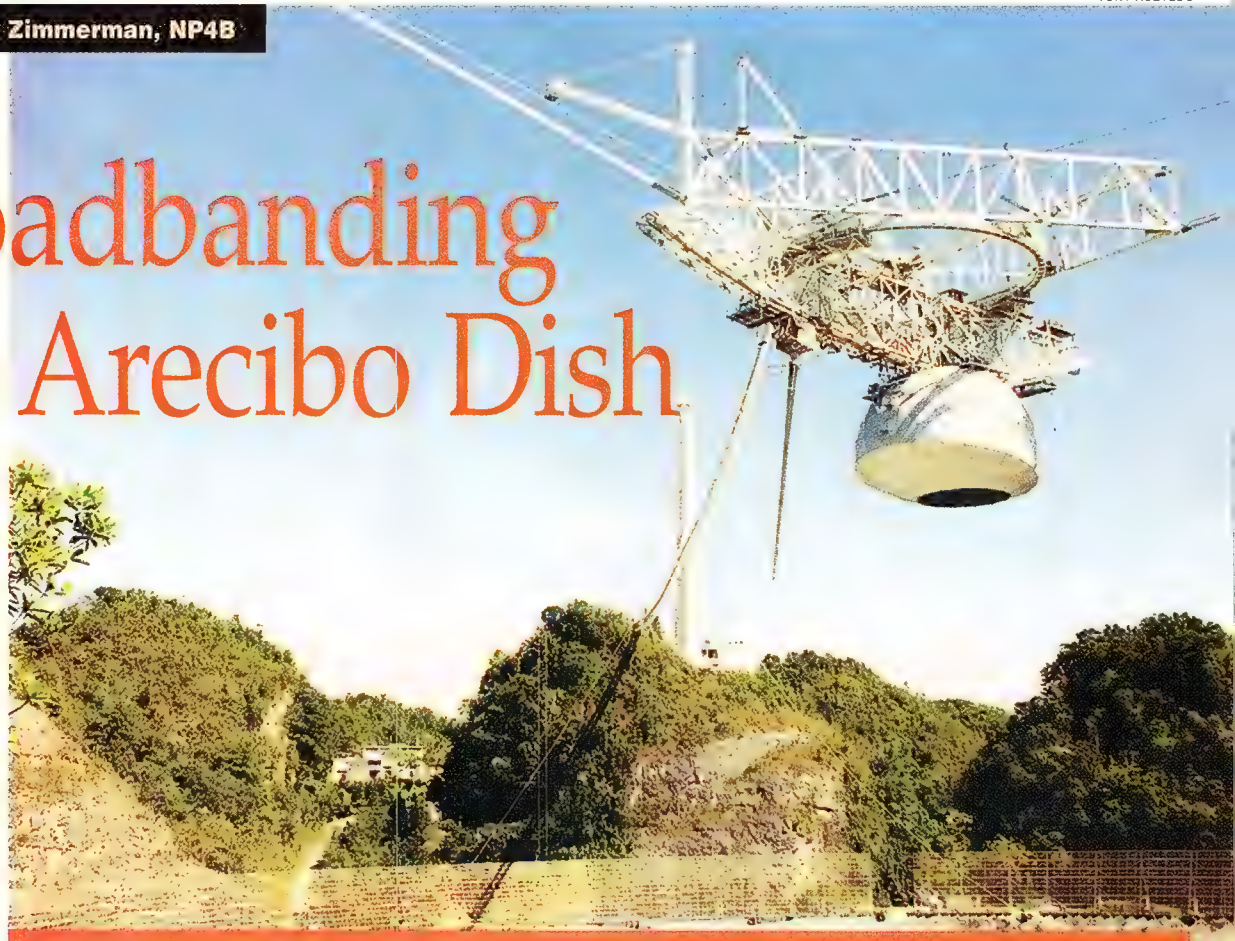
By Robert K. Zimmerman, NP4B

Broadbanding the Arecibo Dish



TONY ACEVEDO

The world's biggest gun (20 terawatts ERP on S band) gets a new broadband feed system.

Arecibo Observatory operates today as a multidisciplinary research center, with emphasis on radio astronomy, radar astronomy, ionospheric studies and research on the middle atmosphere and troposphere. Officially called the National Astronomy and Ionosphere Center, it is operated by Cornell University under a cooperative agreement with the National Science Foundation, the primary funding agency. Arecibo sports the largest "dish" in the world, at 305 meters (1000 feet) in diameter, known worldwide for its unique design. Amateur Radio operators have played an important role at Arecibo since the early days. This article will describe Arecibo from a ham's point of view, covering both past and present activities.

History and Origins

The Arecibo large-aperture antenna was the brainchild of Professor William Gordon at Cornell. In 1958 Gordon calculated the radar cross section of an electron (first calculated by Thomson) and quickly realized that with a suitably large antenna and powerful transmitter one could obtain what we know today as *incoherent scattering* from electrons in the ionosphere. The possibility of investigating *near space* with a radar beam was very exciting to Gordon and the United States scientific community at large. (The Soviet Union had successfully launched Sputnik I during the previous year.)

The building of such a large structure is a huge undertaking, and Gordon ended up seeking funds from the Advanced Research Projects Agency (ARPA). Gordon suggested building a huge parabolic dish *in the ground*, pointing straight upward toward zenith. Early on, Ward Low, an advisor to ARPA and Gordon's contact, suggested a spherical dish. The beam from a spherical dish can be slewed by moving the feed point. Hence, the Arecibo telescope is a steerable antenna with a fixed dish. It is useful for both astronomy and ionospheric research.

Planners considered locations in Hawaii and Puerto Rico for the proposed telescope. Both sites offer low-latitude placement that allows the facility to see some of the southern sky and the ecliptic plane of the planets. The two sites were also part of the United States, meriting such a large investment.

The karst region of Puerto Rico looked especially good, and aerial photography soon revealed three excellent sinkholes.[1] The scale of the photos was such that Earnest Hardy of Cornell slid a 25-cent piece over the photographs to find sinkholes that were about the right size. The sinkhole near Arecibo seemed the best candidate, because it was closest to a road.

The construction began in 1962. Eighteen months and $9 million later, the dish and feed were complete. Today the price tag would be unimaginable, but at 1960 prices, Arecibo was a bargain of the Space Age. Figure 1 shows the completed dish.

Sam Harris

Sam Harris, W1FZJ, made the first Amateur Radio moonbounce (EME) QSO one year before the construction of Arecibo. Sam

[1]A karst is an irregular limestone region with sinks, underground streams and caverns.—*Ed.*

was well known at Microwave Associates as the father of the parametric amplifier (paramp)—the first very-low-noise microwave amplifier. Sam supplied the paramp used by Professor Frank Drake in Project Ozma at the new National Radio Astronomy Observatory. So it was only natural that Arecibo Director Gordon Pettingill asked Sam to supply some of his magic paramps for the new big dish. Icing the cake, Pettingill asked Sam to come work at Arecibo. In 1965, Sam and Helen Harris headed for their final home.

The original Arecibo radar transmitter still operates at 430 MHz, delivering 2.5 megawatt (MW) pulses. The waveguide slot feed illuminates the dish uniformly to develop about 62 dBi gain (resulting in an effective radiated power, ERP, of 4 terawatts, TW). This attraction certainly helped entice Sam Harris to Arecibo. Sam's early ham-radio EME (see "A Ham Visit to Arecibo") from Arecibo effectively launched Amateur Radio EME. Hence, Francis "Sam" Harris and Arecibo are indelibly engraved in EME history.

Sam believed that no transistor would ever match the noise figure of his paramps, and that was true throughout his residency at Arecibo. Sam died from lung disease in 1978, and the first cooled-GaAs FET preamplifiers weren't installed until 1982. Technology moves on, but Sam's role was pivotal.

Arecibo's First Upgrade—1975

Arecibo's early years indicated—to everyone's surprise—that the dish and antenna platform were much more stable than anticipated. Director (1966 to 1968) Frank Drake realized that the structure could work at much higher frequencies if only the dish surface were smoother. The original dish surface consisted of 1/2-inch-mesh hardware cloth. (See Figure 1.) That rumpled surface worked well at 430 MHz, but not at higher frequencies. Drake sold the idea that Arecibo, with an upgrade, could work at S band and beyond. His efforts resulted in the first Arecibo upgrade, in 1974-75.

After removing the old hardware cloth, the E-Systems company installed a smooth aluminum surface. Although smooth, the surface has 4-mm holes that allow sun and rain to pass through the dish in order to maintain vegetation under the reflector.

At the same time, Continental Electronics installed a 500 kW (output) radar transmitter for 2380 MHz (S band). With the antenna gain at S band (by chance, 73 dBi), the Arecibo planetary-radar signal ERP is 10 TW, the strongest signal emitted from Earth.

The 1975 S-band transmitter can operate key down for periods of 20 minutes, or more, which makes it perfect for plotting planet surfaces. By 1983 the observatory had studied almost the entire surface of Venus. The planetary radar has also mapped Mars, Mercury, comets, the Moon (see Figure 2) and some of the larger asteroids in the asteroid belt.

The first upgrade was a complete success. To attest to this new force in astronomy, the facility changed its name from the "Arecibo Ionospheric Observatory" to the "National Astronomy and Ionosphere Center."

Pulsars and a Nobel Prize

In 1967, radio astronomers Jocelyn Bell and Anthony Hewish received the first pulsar signal at Mullard Observatory, Cambridge University, in the United Kingdom. Professor Thomas Gold at Cornell soon realized that the characteristic broadband pulsing signal came from a spinning neutron star. Theorists had long suspected that a supernova explosion would blow away the outer shells of a star's mass, but that the star core might be compressed into nuclear material —a neutron star. At last there was observational evidence to confirm the theorists' conjecture.

Arecibo joined in the search for new pulsars, and was soon known as *the* observatory for pulsar research—and for good reason. The large (20 acre) receiving aperture allows astronomers to receive individual pulsar pulses. There's no need to integrate over long periods, as must be done at small-dish observatories. Observers may study the shapes of individual pulses to glean more detail of the pulsar's structure.

In 1974, Professor Joseph Taylor, K1JT, and his student, Russell Hulse, came to Arecibo in search of new pulsars. They discovered some 40 pulsars in one year! Because pulsars are very compact and massive objects (10 to 20 km in diameter), pulsars don't couple strongly to other objects. As such, they are nearly perfect spinning tops. Normally, their emitted pulses are exceedingly stable. Taylor and Hulse found this true with all their newly discovered pulsars—save one!

The special pulsar known as PSR1913 +16 shows a regular variation over eight-hour cycles. Taylor and Hulse realized that their strange pulsar must be orbiting another compact object. Photographs revealed nothing visual at the position of PSR1913+16, which confirmed that it was the first binary neutron-star system. Further observations suggest that the two neutron stars have about the same mass—roughly 1.4 solar masses each.

Such a small system of rotating masses

Figure 1—The newly completed Arecibo dish, August 15, 1963. The dish material is 1/2-inch-mesh hardware cloth, so you can see vegetation, a road and structures through it.

TOM THOMPSON, JET PROPULSION LABORATORY

Figure 2—A radar reflectivity map of the Moon made at Arecibo with the 430 MHz radar transmitter. Bright craters have smooth surfaces; darker regions are rough and absorptive. The center black region is a data void.

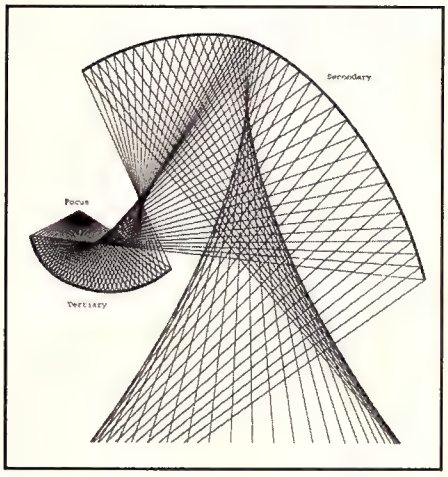


Figure 3—A ray trace of the new Gregorian feed arrangement at the secondary and tertiary mirrors and the focus. The main dish would be off the bottom of the frame.

TONY ACEVEDO

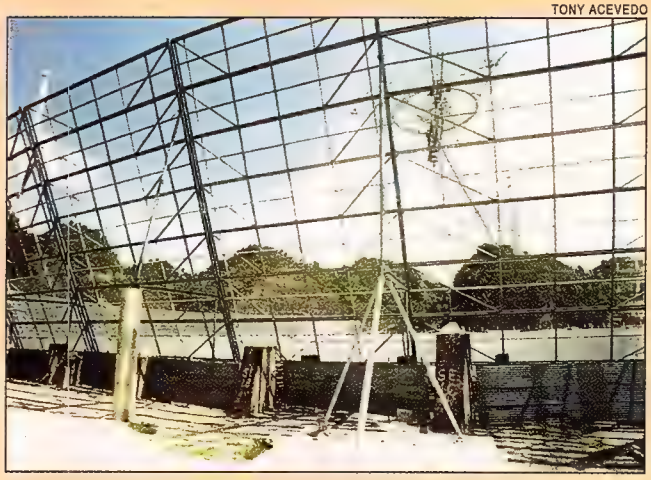


Figure 4—The 50-foot-high screen shields the receivers from local thermal noise at the disc edge.

should radiate considerable gravitational energy, as predicted by Einstein's General Theory of Relativity. If this were the case, mused Taylor and Hulse, the two neutron stars should gradually approach each other, exhibiting an ever-shortening period that would affect the pulsar signal (as a decreasing period of the binary system). Their continued observations showed precisely this! The data confirmed the General Theory of Relativity to better than 0.5%. Taylor and Hulse received the 1993 Nobel Prize in Physics for this discovery. They made all of their prize-winning observations at the Arecibo Observatory.

SETI—The Search for Extraterrestrials

With completion of the first upgrade, the Arecibo telescope gained the capability to receive signals throughout the *Water Hole*—a band of frequencies between the hydrogen line (hydrogen's spectral frequency) and the hydroxyl lines—from 1420 to 1720 MHz.

A Ham Visit to Arecibo

Thirty-two years ago—with a brand new ticket—I thrilled at the recorded sound of signals reflected by the Moon and received on the 1000-foot Arecibo dish operated by EME pioneer Sam Harris, W1FZJ, and others. A July 3, 1965, operation spearheaded by W1FZJ activated KP4BPZ on 432 MHz EME for 25 contacts. That big-dish operation gave a much needed boost to Amateur Radio EME and inspired in me a life-long interest in VHF and UHF.

My friend Elaine, VE3UXZ, earned her license in the 1990s. She knew little about this exciting chapter of Amateur Radio history.

Our club, the Toronto VHF Society, VE3ONT, has mounted EME operations from the Algonquin 150-foot dish during annual ARRL EME Contests since 1993, but we were squeezed out in 1996, during the Algonquin dish upgrade project.

After seeing the Arecibo Observatory scenes in the James Bond film *Golden Eye,* Elaine suggested a visit to the largest radio telescope in the world.

The official Puerto Rican tourist guide, *Que Pasa,* mentions that the Arecibo Observatory is open to the public Tuesday through Sunday and gives directions to the site. We wanted a behind-the-scenes tour, so we sought an Amateur Radio connection. Over dinner with Bill, AA4TJ, at the 1996 International EME Conference (in Bowie, Maryland) last summer, we learned that Bob, NP4B, is the assistant director of the Observatory's Electronics Department. By exchanging e-mail messages with Bob over the next few months, Elaine discovered that we are all EMEers and share many common interests. We soon hatched a plan for a ham visit to the observatory and followed by an island tour.

When we arrived in KP4, we found a highly industrialized mini-nation. There are malls filled with shops and familiar US stores, lush tropical rain forest and beaches that rival any in the Caribbean. The highways are excellent. Although the mountain roads may be narrow and winding, they are well maintained.

The Arecibo Observatory is 90 minutes' drive west of San Juan in a karst region that features sinkholes, haystack hills and underground caves. One of the world's largest cave networks, on the Rio Camuy, is a well-developed tourist park just a few miles from the Observatory. Mountains near the dish are famous for coffee plantations that produce gourmet beans, and hikers discover wide vistas of the island.

Barrio Esperanza is near the dish. We stopped in the cemetery there to visit the grave of W1FZJ. I remember Sam for his stint as *QST* VHF Editor, for the first amateur EME contact, for his development of parametric amplifiers and many other VHF-UHF accomplishments from W1BU, his New England station.

Photograph A shows that the Arecibo Observatory Visitor's Center is nearing completion at the rim of the dish. Funded by a donation from the Angel Ramos Foundation, the center will soon provide visitors with a new panorama of the dish—as well as exhibits, souvenirs and information on the Observatory's scientific programs.

The recently installed Gregorian feed now provides continuous coverage from 300 MHz to 10 GHz. An older line feed used for 430 MHz ionospheric radar remains in place—possibly for future amateur EME operation?

The entire platform structure has been reinforced, and new

TONY ACEVEDO

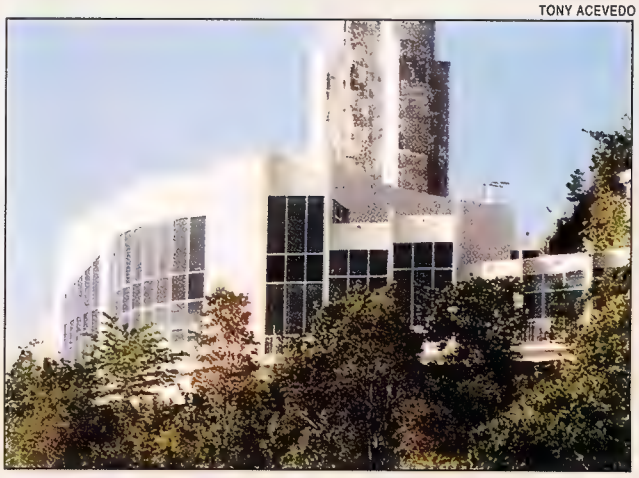


Photo A—The new Arecibo Observatory Visitors' Center is complete at press time.

RFI at Arecibo Observatory?

Radio Frequency Interference is a growing concern for the Arecibo Observatory. When the observatory was built in 1963, its location might have been considered remote—but not anymore!

Puerto Rico is alive with commercial FM, television, beepers, cellular phones and personal communication services. Soon it will to be bombarded from low-Earth orbit by Motorola's Iridium phone system.

As these services expand, Arecibo has become more sensitive to interference. Until recently, all observations used slotted waveguide feeds, which have very narrow passbands. Signals outside the feed passband never even made it to the preamplifier! With the new Gregorian feed optics, the telescope is essentially wide open from 300 MHz to 10 GHz.

An RFI committee of staff members meets monthly to address the issue of interference. A remotely controlled RFI shack monitors interference that severely affects the observatory, spanning the range from VHF through 10 GHz. Amateurs seldom cause interference to the observatory, and on occasion have helped us track down offending sources.—*Robert Zimmerman, NP4B*

Many suggest this band as a logical meeting place for extraterrestrial civilizations communicating via radio. The new planetary radar transmitter—although not quite *in* the Water Hole—sent the Arecibo Message (via FSK at 2380 MHz, intended for extraterrestrials) into space during the upgrade dedication ceremony in November 1975.

Since that time there have been several SETI programs at Arecibo. Some were searches of nearby star systems by Professor Paul Horowitz, W1HFA, of MIT, and Jill Tarter, then at NASA's Ames Research Center. These short-duration searches led to the NASA High Resolution Microwave Survey, which began on the 500th anniversary of Christopher Columbus's landing in the Western Hemisphere, October 12, 1992. This was to be a long-duration survey, projected to last 10 years and regarded by many SETI people as the first credible search. Unfortunately, it didn't last: The US Congress killed the survey funding after the first year.

Searches will continue at Arecibo. Dr Tarter is now with the private SETI Institute and plans a return to Arecibo for a joint Arecibo/Jodrell Bank project. Is Arecibo big enough to do the job? Paul Shuch, N6TX, president of the SETI League (a different organization than the SETI Institute), has calculated that Arecibo could detect the transmissions from a similar installation located one-fifth of the way across the diameter of the Milky Way galaxy! Someday there might be a better SETI instrument, but for now, Arecibo remains the best bet for detecting other advanced civilizations.

And, by the way, former Arecibo Director Frank Drake is now the president of the SETI Institute.

Arecibo's Second Upgrade—1996

After the first upgrade, astronomy blossomed at Arecibo, with extensive observations of the hydrogen (H) line at 1420 MHz and the hydroxyl lines (OH) at 1612, 1665, 1667, and 1720 MHz. Nonetheless, one of the very features of the observatory hampered research: The spherical dish has a focal *line* rather than a focal *point* (as with a parabolic reflector). This required a long, slotted utility cranes were added to hoist construction equipment. A cable car and a catwalk give access to the platform, but both are off limits to visitors.

With Bob driving our Jeep, we negotiated a spiral road to the bottom of the sinkhole in which the dish sits. Cables and concrete anchors support the dish surface 18 feet above the natural bowl. Sunlight filters through the dish skin to a dense fern growth that stabilizes the surface soil. (See Photo B.) An opening at the vertex allows an unobstructed view of the 800 ton platform structure, the control room, the new visitor's center and support towers.

While ascending the spiral road to the rim, we passed massive concrete cable anchors and support towers for the suspended feed system and reached a vantage point for the entire area.

A UHF TV station on a nearby mountain operates on one half the hydrogen line frequency, the most likely frequency for SETI exploration. The Observatory monitors the entire radio spectrum for possible interference to its scientific programs and seeks the cooperation of all local spectrum users, including radio amateurs.

Computer workstations in the control room initiate tracking and feed motion. The control console for the 430 MHz transmitter is still there and recognizable from the 1965 photos of the KP4BPZ operation. Other rooms house the 430 MHz ionospheric radar transmitter and its power supply. Two eight-foot klystrons, powered by a 100 kV supply, generate 2.5 MW RF pulses for Moonbounce, Venusbounce, and Marsbounce!

Thanks to all the radio amateurs we met and who made our visit to the Observatory informative and enjoyable (see Photo C): Bob Zimmerman, NP4B; Bill Genter, NP3O; and others.—*Dennis Mungham, VE3ASO**

*Sadly, VE3ASO suffered heart failure and became a Silent Key a few weeks after writing this sidebar. His friends and the EME community will miss him.—*Ed.*

TONY ACEVEDO

Photo B—A view from under the dish. Concrete anchors and cables stress the dish downward to maintain its spherical shape.

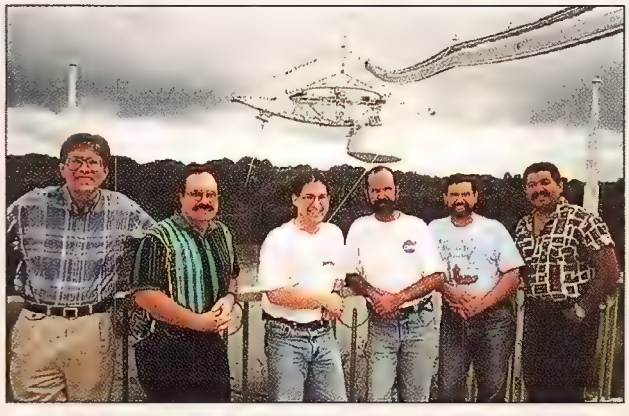


Photo C—Arecibo hams on a stormy day (l-r): author Bob Zimmerman, NP4B; Bill Genter, KP3O; Christian Bonilla, NP3FL; Rey Velez, KP4EKA; Ricardo Elias, NP3GH; and Angel Vasquez, KP3AP.

Controlling the World's Largest Telescope

The Arecibo Observatory is a unique telescope in many aspects—not only its optics, but also how we point it at the sky.

The telescope must achieve a pointing accuracy of better than 5 arc seconds in the sky, with a suspended structure weighing over 900 tons and as large as a seven-story building. As one can imagine, tracking a target is not a trivial task. It is a good thing our targets do not perform evasive maneuvers.

The coarse adjustment is handled in a standard az-el fashion. The large azimuth ring (130-foot diameter) on the platform's underside positions the azimuth arm (about 400 tons) to an accuracy better than 0.7 mm. (See Photo D.) This happens by means of 32 wheels, of which eight have electric motors. These drives can move the arm at 25° per minute (about seven minutes for 180°).

The azimuth arm contains a rail surface (along zenith) where two houses ride—the small, old one is the Carriage House and the other is the Gregorian Dome. Each can move from 0° (antenna pointing straight up) to 20° from zenith. These houses can move at a speed of 2.5° per minute. The Carriage House weighs about 22 tons and the Gregorian Dome weighs about 100 tons. These drives together perform the coarse pointing. To achieve the required pointing accuracy, we must consider other factors.

Since the Carriage House weighs much less than the Gregorian Dome, the azimuth arm is grossly unbalanced. To correct for the unbalance, tie-down blocks permit adding up to 60 tons at each corner of the triangular platform. A computer monitors the temperature, dome position and cable tension, and calculates the necessary corner loads to guarantee that the platform will stay level during normal operating conditions.

The Gregorian Dome contains the secondary and tertiary reflectors and the rotating feed floor. The tertiary reflector has three degrees of freedom, to aid in focusing, fine pointing corrections and antenna beam tilting. The total weight of the tertiary is about 2000 pounds, and the total range of motion is less than 20 inches.

The rotating feed floor is a 19 foot turntable weighing as much as 7000 pounds. The receivers are on this turntable. To select a band, the floor turns to place the desired receiver at the focal point. The floor must change between adjacent receivers (about 24 inches apart) in two seconds. The entire floor can rotate at 18° per second, making an entire 360° rotation in 20 seconds.

TONY ACEVEDO

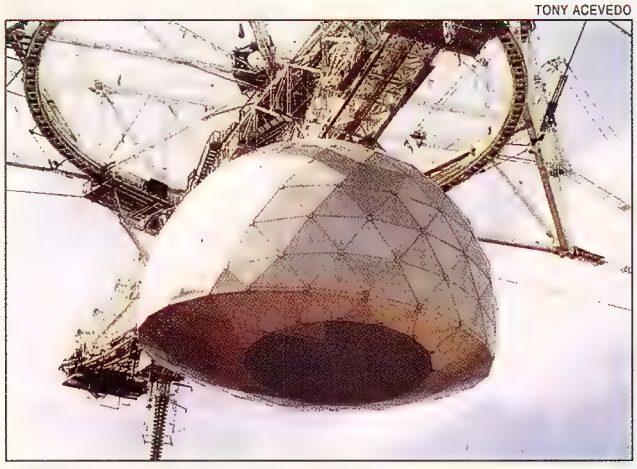


Photo D—A near view of the triangular platform and feed-positioning system. The large circular track supports the azimuth arm below it. The Gregorian Dome hangs from the crescent lower edge of the arm. The black spike below the Dome is the 430 MHz line feed, which hangs from the Carriage House (partially obscured by the Dome's left edge).
TONY ACEVEDO

A total of five single-board computers perform all coordinate transformation and axis-command generation. After a particular axis command is generated, it is sent via fiber optics to each axis processor and acted on. Each axis processor contains a microcontroller that performs a detailed algorithm to achieve the controlled motion.

The entire control system contains over 50,000 lines of C program code and over 80 megabytes of RAM. The drives use 28 electrical motors that require over 100 kW of power.
—Ricardo Elias, NP3GH

waveguide *line* feed assembly, with a different assembly for each band of interest. The maintenance department was kept very busy raising, installing, lowering and storing feed assemblies, as requested by different researchers. This continual effort made scheduling difficult, for there was a natural desire to group researchers by desired frequency.

Sebastian Von Horner (at Greenbank) was the first to suggest a remedy to the Arecibo problem. His mid-1970s paper showed how a system of two curved mirrors could be suspended over the Arecibo dish to convert the system from a *line* feed to a broadband *point* feed. (See Figure 3.) What is more important, the mirror system would function at *any* frequency. For the first time Arecibo would be truly broadband. We call this the Gregorian feed system.

Many years passed before the National Science Foundation committed itself to the second Arecibo upgrade. Construction of the mirror system and its protective dome (85 feet in diameter) began in 1993. The dome also contains a two-story structure to house transmitters, receivers and control apparatus. At press time, the Gregorian Dome is in place. Workers are installing an array of cryogenic (HEMPT) low-noise receivers inside the dome. The receiver room (lower floor) has a rotating turret floor with space for eight cryogenic receivers. Any one of them may be positioned at the prime focal point in a matter of seconds.

Above the receiver room is a transmitter room with a new 1-MW (20 TW ERP) S-band planetary-radar transmitter. The waveguide is cooled by attached water pipes to avoid meltdown! This powerful transmitter will further enhance the position of radar astronomy at Arecibo. It should be possible to image many asteroids in the asteroid belt.

As part of the second upgrade, a 50-foot-high shield wall was erected around the main reflector's circumference. (See Figure 4.) This keeps thermal noise (from warm rocks and vegetation) around the edge of the dish from desensitizing the cryogenic low-noise amplifiers.

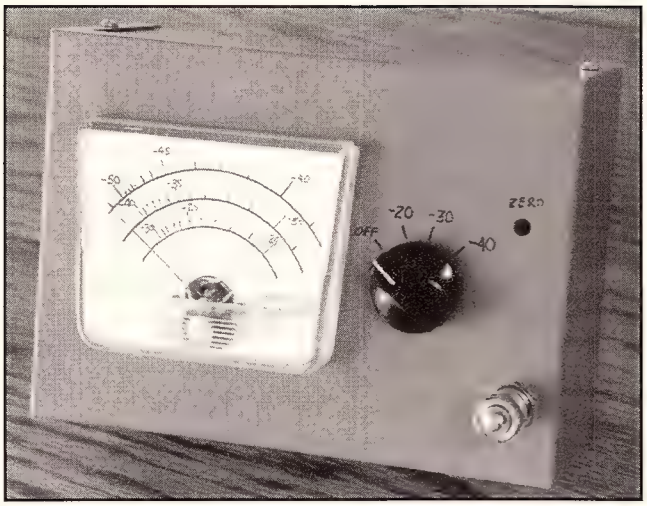
Arecibo Today

Arecibo is ready today for an epoch of new research with essentially a new observatory. Observations are possible anywhere from 300 MHz to beyond 10 GHz. The observatory rededication following the upgrade will occur in June. It's difficult to say what the future holds for Arecibo: Remember that, when the telescope was built, only theorists talked about neutron stars! Surely as the observatory enters its third life (with the second upgrade) new discoveries will shake the world of science and perhaps the world in general.

Bob Zimmerman was first licensed at age 13 in 1965. He studied at Southern Illinois University, Edwardsville (BS and MS in physics) and then switched to electrical engineering at the University of Illinois, Urbana-Champaign (MSEE). He hopes to spend his entire career in radio electronics.

He has worked at Watkins-Johnson Company (antennas), Arecibo Observatory (low-noise receivers), NASA Goddard Spaceflight Center (laser communications), the Voice of America (high-power transmitters) and has now returned to the Arecibo Observatory to head the Transmitter Section of the Electronics Department. With the support of his wife and two daughters, he is constructing a 1296 MHz ham EME station at their home in Arecibo. He may be reached at: **zimmo@naic.edu.**

By Denton Bramwell, K7OWJ



The Microwatter

For less than $50, you can have a great piece of test equipment—and some building fun, too!

Here's a simple, easy to build terminating microwattmeter.[1] It can measure power levels from below –50 dBm (10 nW) to –20 dBm (10 μW) with an accuracy of within 1 dB at frequencies from below the broadcast band up to 2 meters. Beyond that, it's still capable of making *relative* power measurements. The range of the meter can be extended by using an attenuator[2] or by adding a broadband RF amplifier.

There are many uses for this meter. Combined with a signal generator, you can use it to characterize crystal and LC filters, for direct, on-air checks of field strength and measuring antenna patterns. With the oscillators, resonance-indicating probe and a simple return-loss bridge such as shown in Wes Hayward's "Beyond the Dipper,"[3] this meter makes an excellent tool for analyzing antenna or other circuit impedances. (In fact, the Microwatter is derived directly from the detector Wes used in his article.) If you are fortunate enough to have a 50-Ω oscilloscope probe (or a high-impedance probe), you can also use the Microwatter as an RF voltmeter for circuit testing.

Design

The circuit concept is quite simple (see Figure 1). Two nearly identical diodes (D1 and D2) are biased on by a small dc current. RF energy is coupled to one of the diodes, which then acts as a square-law detector.[4] The difference between the voltages present on the two diodes is amplified by a differential amplifier (U1) and applied to an analog voltmeter equipped with hand-calibrated ranges. As they say, however, "the devil is in the details." Getting adequate stability requires careful selection of parts.

Diodes

D1 and D2 must have a low junction capacitance and a fast response in order to provide the desired bandwidth. Their temperature coefficients must also be extremely well matched. My attempts at hand-matching hot-carrier diodes and coupling them thermally delivered disappointing results. The solution is to use a very old part: the CA3039 diode array.[5] The diodes in this device are very fast silicon types, with exceptional thermal matching.[6] Any two diodes of the array—except the one tied to the substrate—can be used for D1 and D2. Unused IC pins can be cut off or bent out of the way. If you have access to similarly rated arrays of hot-carrier diodes, by all means, use them. You may end up with a better frequency response than I obtained!

Amplifier

Another contributor to stability is the amplifier I chose: a Burr-Brown INA2128. This IC provides two differential amplifiers with exceptional specifications: low thermal drift, superb common-mode rejection and low noise. It offers excellent performance and is extremely easy to apply. In this circuit, one half of the INA2128 provides dc amplification of the detected voltage; the other half serves as a low-impedance offset-voltage source used for error nulling.

Terminating Resistor

The RF-input terminating resistor is composed of two 100-Ω resistors (R3 and R4), providing a cleaner 50-Ω termination than a single resistor does. If you have them, use chip resistors. If not, clip the leads off two standard 100-Ω resistors and carefully scrape away the paint at each end. After installing the resistors, verify the input resistance with an ohmmeter.

Power Supply

A stable power source is required. Operating the circuit from an unregulated battery supply allows slight relative changes in the local ground as the terminal voltage drops, creating drift in the reading. The Zener diodes (D3 and D4) following regulator U2 provide a simple, dynamic means of splitting the 12-V supply into the three voltages required to power the circuit.

C1 and C11 should be as close as physically possible to U1 pins 1 and 2. In combination with R1 and R5, these capacitors provide good immunity to unwanted RF. R14, the **OFFSET NULL** potentiometer, allows nulling the dc amplifier offset and any offset from slight mismatches in the CA3039 diodes. Use a multiturn potentiometer for R14—10 turns or more. Whether you use a panel-mount pot, or a PC-board-mounted trimmer as I did, R14 must be accessible. On the most-sensitive range, the instrument must be zeroed before each use.

The forward voltage drop difference between any two diodes in the CA3039 is specified as "typically less than 0.5 mV." If your device is typical, the nominal values of 5.1 kΩ for R10 and 3.9 kΩ for R9 will do just fine. Note, however, that the manufacturer does not reject parts until the forward voltage drop difference is *5 mV*—so the 0.5 mV figure isn't totally dependable, although it is correct for the two units I built. You can always rotate the diode array so that pins 1, 2, 3 and 4 occupy the spots designated for pins 5, 6, 7 and 8. That gives you a second set of diodes from which to choose. The simplest general solution for a homebrew project is to use nonidentical values for R9 and R10 (as I've done here), just in case the manufacturer decides to use the full specification range.

If your diode array isn't typical, your Microwatter won't zero properly. The solution is simple. Remove R14 from the circuit. Temporarily connect one end of a 10-kΩ potentiometer to the +8.1 V supply and attach the other end to the –3.9 V supply. Connect the pot arm to the PC-board point of R14's arm. With this arrangement,

[1]Notes appear on page 35.

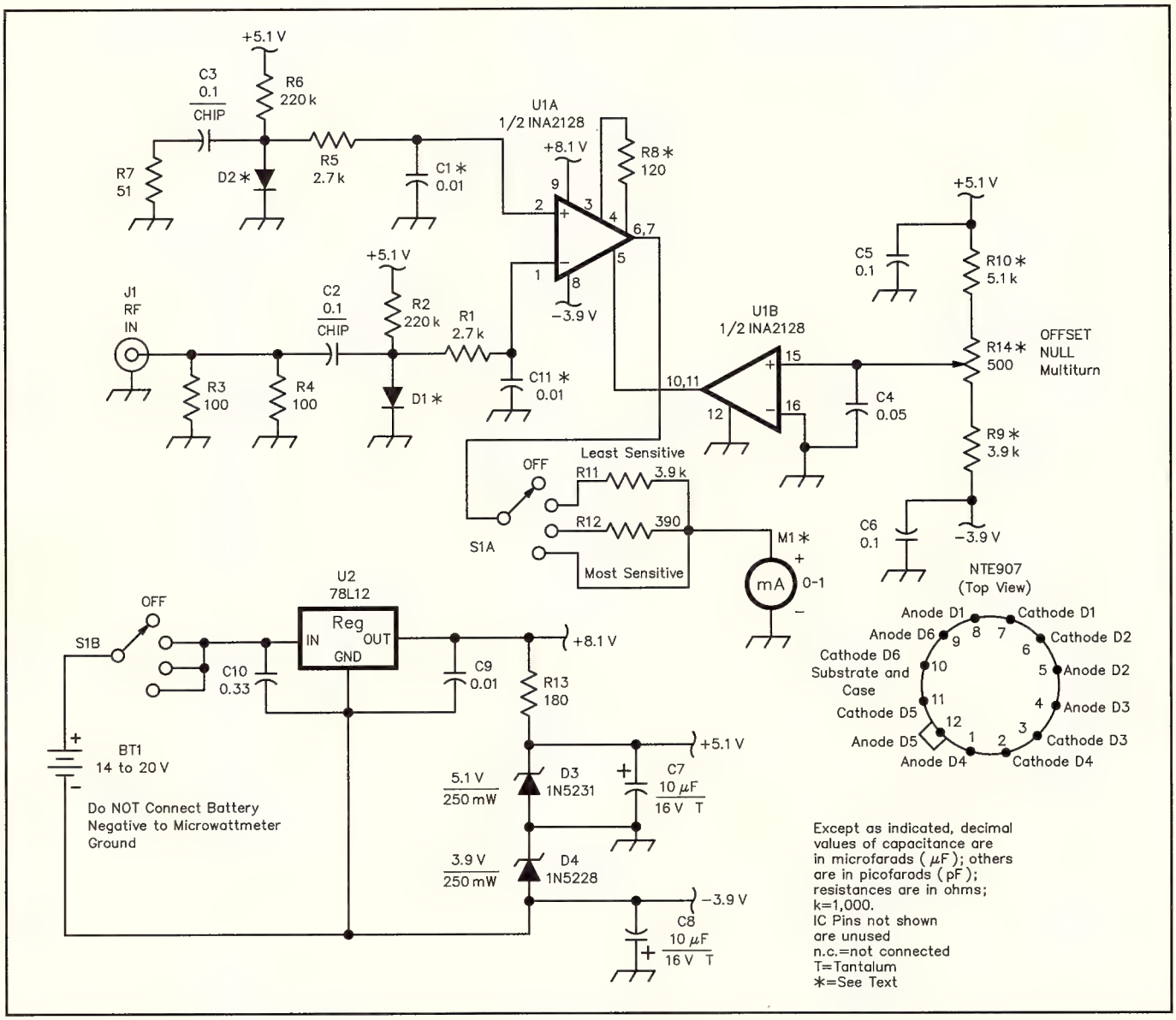


Figure 1—Schematic of the Microwatter circuit. Equivalent parts can be substituted. Unless otherwise specified, resistors are 1/4-W, 5%-tolerance carbon-composition or film units.

D1, D2—Part of CA3039 or NTE907 diode array; see text and Notes 1 and 5. The NTE907 is available from Mouser Electronics, 2401 Hwy 287 N, Mansfield, TX 76062, tel 800-346-6873, 817-483-4422; fax: 817-483-0931 e-mail **sales@mouser.com**; Web URL **http://www.mouser.com**.

M1—1-mA meter movement, 50 Ω internal resistance; see text

R14—500 Ω, 10-turn (or more) potentiometer; see text

S1—2-pole, 4-position rotary switch

U1—Burr Brown amplifier INA2128P; Digi-Key INA2128P; available from Digi-Key Corp, 701 Brooks Ave S, Thief River Falls, MN 56701-0677 tel 800-344-4539, 218-681-6674; fax 218-681-3380; Web URL **http://www.digikey.com**.

U2—78L12, positive 12-V, 100-mA voltage regulator; Digi-Key LM78L12ACZ.

you'll be able to zero your Microwatter, although the setting will be sensitive and might not produce an exact zero. Once you have the zero point, turn off the Microwatter and remove the 10-kΩ pot carefully without disturbing its setting. Measure the resistance between the pot arm and end that was connected to the +8.1 V point—this is the value of R10. R9's value is that measured between the pot arm and the end previously connected to the −3.9 V point. The combined value of these two resistors and that of R14 provides a total resistance of about 10.5 kΩ, and the resistance ratios will allow easy meter zeroing.

The Meter Movement

The meter movement I used has a 50-Ω internal resistance. Hence, on the most sensitive scale, a 50 mV output from U1 provides full-scale deflection. The middle and upper scales require 440 mV and 3.95 V, respectively, for full-scale deflection. See the sidebar "Selecting a Meter Movement" for information on using other meters in this circuit.

Construction and Calibration

For the prototype, components are mounted on double-sided PC board (see Note 1) with one side acting as a groundplane. I used a 5×7×3-inch aluminum box, primed and painted gray, for the cabinet. Power is supplied by a set of NiCd batteries glued to the inside rear of the cabinet. The PC board is small enough to be mounted on the back of the input BNC connector without other support. Once you have completed PC-board assembly, remove the solder flux from the board. This is important.

Selecting a Meter Movement

For M1, I used a 1-mA meter movement with an internal resistance of 50 Ω. Hence, on the most-sensitive scale, 50 mV of output from U1 of Figure 1 provides full-scale deflection, the middle and upper scales requiring 440 mV and 3.95 V for full-scale deflection. Here's how you can use a meter that has a different internal resistance or current sensitivity.

Consider, for example, a 25-μA meter movement with an internal resistance of 1910 Ω—my junk box coughed this one up. A signal level of 47.8 mV (25 μA× 1910 Ω) provides full-scale deflection, so this meter can be substituted directly for the 1-mA, 50-Ω meter on the most sensitive scale. On the middle and top scales, the values of R12 and R11 should be 15.69 kΩ and 156.1 kΩ,* or values close to those.

If the most sensitive meter you can find requires 80 to 100 mV to drive it to full scale deflection, don't worry. The Microwatter's most-sensitive scale will be compressed, but quite usable. The middle and top scales will still run full scale, probably not even requiring a change in the values of R11 and R12, if you use a 1-mA movement.—*Denton Bramwell, K7OWJ*

**The ARRL Handbook for Radio Amateurs*, 74th ed (Newington: ARRL, 1996), p 26.5, and earlier editions.

To calibrate the Microwatter, you'll need a 50-Ω RF source with a known output level. If you are lucky enough to have a calibrated, wide-range RF source, that makes the task easier, but such a source is not necessary. A suitable signal source can be made from a crystal oscillator[7] and an attenuator,[8] using at least 6 dB of attenuation between the oscillator and the Microwatter at all times. The output of such a system can be calibrated with an oscilloscope, or with a simple RF meter.[9] Any frequency in the mid-HF range is suitable for calibration—I used 10 MHz.

Remove the meter-face cover and prepare the face for new markings. I painted mine white and used India ink to make the meter scale arcs and incremental marks. Before calibrating the Microwatter, let it stabilize at room temperature for an hour, and turn it on at least 15 minutes before use. (At these low power levels, even the heat generated by the small dc bias on the diodes needs time to stabilize.) Set the Microwatter to its most sensitive scale. Use R14 to set the meter needle to your chosen meter zero point and mark that point with a pencil. Then apply a –40 dBm signal and mark the top end of the scale. Decrease the input signal level in 1-dB steps, marking each step. Recheck your meter zeroing, switch the Microwatter to the middle scale, apply a –30 dBm signal and mark this point. Again, decrease drive in 1-dB steps, marking each. Repeat with the least-sensitive scale, starting with –20 dBm. Once this is done, replace the meter-face cover and your Microwatter is ready to use.

Wrap-Up

The Microwatter is rugged and portable enough to use in the field as well as on the workbench. With its VHF bandwidth and high sensitivity, it can provide you with a wealth of information about your antenna or your next workshop project.

Notes

[1]A PC board and some components for this project is available from FAR Circuits, 18N640 Field Ct, Dundee, IL 60118-9269, tel 708-836-9148 (voice and fax). Price: one PC board only, $4; package including one PC board, one CA3039 and one INA2128, $19. Add $1.50 shipping for up to four boards and board/component packages. Visa and MasterCard accepted with a $3 service charge. A PC-board template package is not available.

[2]Denton Bramwell, K7OWJ, "An RF Step Attenuator," *QST*, Jun 1995, pp 33-34. See also the 18th edition of *The ARRL Antenna Book*, pp 27-37 to 27-38. (Newington: ARRL, 1997).

[3]Wes Hayward, W7ZOI, "Beyond the Dipper," *QST*, May, 1986, pp 14-20.

[4]Wes Hayward, W7ZOI, and Doug DeMaw, W1FB, *Solid State Design for the Radio Amateur*, (Newington: ARRL, 1986) 3rd printing, p 147.

[5]The NTE907 replacement is available from Mouser Electronics, 2401 Hwy 287 N, Mansfield, TX 76062, tel 800-346-6873, 817-483-4422; fax: 817-483-0931 e-mail **sales@mouser.com**; Web URL **http://www.mouser.com**.

[6]The absolute value of the difference in forward drop between any two diodes is 1 mV/°C.

[7]See referent of Note 4, p 19, Figure 3 or 4.

[8]See Note 2.

[9]See referent of Note 4, p 147.

Denton Bramwell, K7OWJ, was first licensed in 1960, as KN7OWJ. His professional career includes assignments at Tektronix and Heath. He is now the Operations Training Manager at Iomega, in Roy, Utah. You can contact Denton at 2853 E Country Oaks Dr, Layton, UT 84040, e-mail ***denton@konnections.com****.*

New Products

THE "ISLAND KEYER" KIT FROM MILESTONE TECHNOLOGIES

◊ The tiny Island Keyer kit measures just 1.5 × 2 inches and can be configured to use less than a microamp when idling. The mini keyer has four memory areas that can store a total of 500 Morse code characters. Features: straight-key input; selectable-pitch sidetone; a Morse code speed readout and keying speeds from 7 to 48 WPM.

The kit includes all board-mounted parts—you supply pots, jacks, pushbutton switches and a battery holder (an optional hardware pack is available).

Prices: kit, $21.95 plus $2 for First-Class USA shipping ($5 for Priority Mail); hardware pack, $12 (no additional shipping if ordered with the keyer kit). For more information, or to place a credit card order, contact Milestone Technologies at 3140 S Peoria St, Suite K-156, Aurora, CO 80014; tel 800-238-8205, e-mail **75230.1405@compuserve.com**, WWW **http://www.mtechnologies.com/mthome**.

HAMCALC VERSION 23: GET IT RIGHT FROM THE SOURCE!

◊ *HAMCALC*, now in version 23, is an established and useful collection of electronic design and reference programs that has been a favorite or hams, engineers and schools for more than four years. The easy-to-use program requires a DOS-compatible PC with a 3.5-inch disk drive. Run *HAMCALC* from a floppy or install it to your hard drive.

To stay on top of the often-upgraded release, author George Murphy, VE3ERP, suggests that users get the latest, most up-to-date version directly from him, as the copies found on-line and in many CD-ROM software collections aren't current. According to Murphy, *HAMCALC* has never been officially uploaded to any electronic service or collection.

To get your copy send $5 (US funds only, check or money order) to cover materials and airmail postage to George Murphy, VE3ERP, 77 McKenzie St, Orillia ON L3V 6A6, CANADA.

INTERNATIONAL 9092 RG-8X COAXIAL CABLE FROM THE RF CONNECTION

◊ International Electronics' new RG-8X Type II coax is a 50-ohm cable with a non-contaminating PVC jacket and a foam polyethylene dielectric. Physical specs: shield, 90% bare copper braid (34 AWG); center conductor, 16 AWG tinned copper (stranded). Velocity factor: 78%. Power and attenuation range from 4000 W at 1 MHz to 65 W at 3 GHz (with 26 dB attenuation per 100 feet at 3 GHz).

Price: $0.25 per foot with discounts starting at 100 feet. For more information, contact The RF Connection at 800-783-2666, fax 301-869-3860, WWW **http://www.therfc.com**.

By R. Dean Straw, N6BV

So What's New in the Newest *ARRL Antenna Book*?

"Hey, Martha, that N6BV guy's back at it again, hyping the new *Antenna Book*."

Okay—guilty as charged! Three years ago, when my *QST* article about the 17th Edition[1] hit the streets, I received lots of good-natured kidding from my friends, who know me as an enthusiastic sort of guy. This time I'm even *more* fired up about the value of the new 18th Edition of *The ARRL Antenna Book*!

Evolutionary Change

First, let me point out that the new 18th Edition is an evolutionary change from the 17th Edition. Although the early chapters on basic theory and fundamentals have been completely rewritten, they were built on the solid base of what had been there for almost 50 years.

[1]Notes appear on page 38.

But, to build on that solid base, I had the newest computerized modeling and analysis tools. As a result, you will find even more computer-generated antenna pattern plots throughout the new book, following the tried-and-true maxim that "a picture is worth a thousand words."

Figure 1 is an example of that computer modeling; it shows the "impedance spiral" for a theoretical 100-foot-long dipole made of #10 wire and mounted in free space. The frequency, which has been swept over the range from 1 to 30 MHz, is shown printed above the spiral line. You can see that the impedance changes pretty dramatically over the frequency range. There is a series of such graphs in the new *ARRL Antenna Book* that show, in an intuitive fashion, how impedance changes with the ratio of wire diameter to length, all the way from "infinitely thin" to really large diameters.

During the roughly 50 years that *The ARRL Antenna Book* has been in existence, material on low-frequency antennas had become dispersed throughout several chapters, making for disjointed reading at times. In the 18th Edition, this material has been gathered into a single comprehensive Chapter 6—with lots of brand-new, interesting information added as well.

My sincere thanks go to Rudy Severns, N6LF, who labored mightily to organize and write the Chapter 6 material. Rudy is also an accomplished sailor, and Chapter 16 adds some brand-new material dealing with maritime HF antennas.

Keeping the Balance

Over the years, the League has often struggled to maintain a delicate balance between having too much math or too little math in our books. We have found that a combination of printed material in a book and interactive software programs can re-

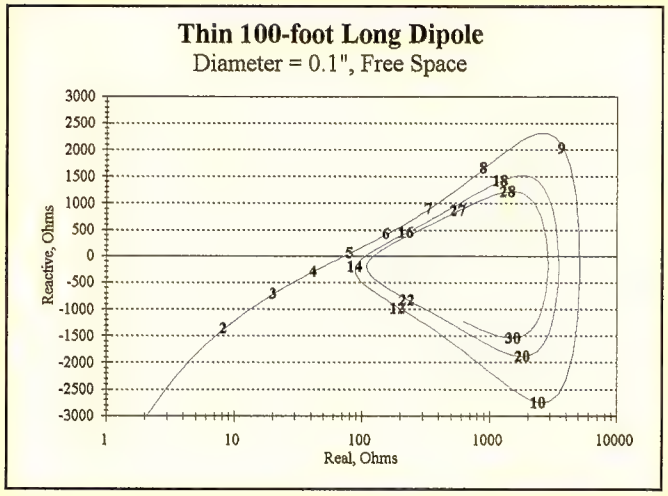


Figure 1—Feed-point impedance versus frequency for a theoretical free-space, 100-foot-long dipole, fed in the center. It is made of 0.1-inch-diameter (#10) wire. The y-axis is calibrated in positive (inductive) series reactance up from the zero line, and negative (capacitive) series reactance in the downward direction. The x-axis is logarithmic because of the wide range of the real, resistive component of the feed-point impedance—from roughly 2 Ω to 5000 Ω. Note the range of change in reactance, ranging from –2700 Ω to +2300 Ω. The numbers placed along the spiral curve show the frequency in MHz.

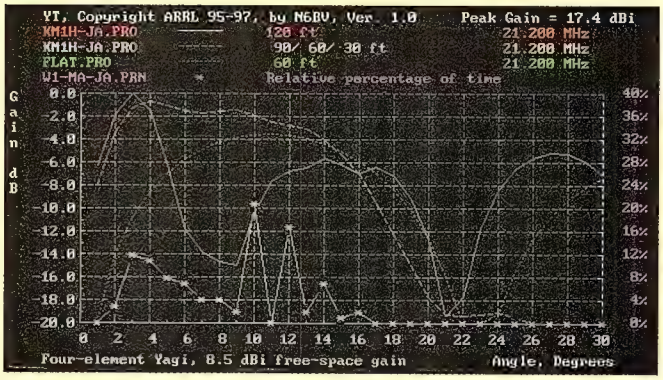


Figure 2—*YT* output screen, showing computed 21.2-MHz elevation response at KM1H in the direction of Japan, comparing a single four-element Yagi at 120 feet, and a stack of three identical four-element Yagis at 90, 60 and 30 feet, fed in phase. The elevation response for a 60-foot-high four-element Yagi over flat ground is also shown for reference. The statistical percentage of time when the 15-meter band is open at each elevation angle is overlaid on the same graph.

ally "bring to life" equations and tough theoretical concepts for many amateurs. For example, we've found that the processes occurring inside a transmission line are a source of great mystery to many. Running software that can demonstrate what is going on at the input, the output and all along the line under various degrees of mismatch can really enhance understanding.

Did you ever think about how much loss there is in an antenna tuner when it is presented with a *really* weird load? You can almost imagine smoke and fire pouring out of the antenna tuner cabinet when you read the results of a computer run that analyzes a particularly difficult load—such as an accidental short at the antenna, for example!

The Elevation Angles Needed for HF Propagation

In the 17th Edition, some pioneering work was done in the area of propagation analysis. The disk bundled with that book had 60 tables showing detailed elevation angles statistics. The new 18th Edition contains a *lot* more data files. In addition to a total of 20 geographic sites throughout the USA, there are now data files for 40 typical locations throughout the world, organized by continent. If you're planning a DXpedition somewhere, you can do your homework beforehand, using your new *ARRL Antenna Book*! Virtually wherever you go in the world, you now have detailed statistical information about the elevation angles you need to cover.

The Effects of Local Terrain

For years, amateurs have speculated on what makes a particular location really great for HF DX work. Several years ago, the ARRL asked me to start a detailed study of the effects of local terrain on the launch of HF signals. This led down a torturous path that was littered with very heavy-duty mathematics, in the form of the "Uniform Theory of Diffraction." The result is a new computer program called *YT*, or *Yagi Terrain Analysis*.

Using data entered from topographic maps, *YT* computes the effects of reflection and diffraction over real terrain for horizontally polarized Yagis. The elevation-angle response over a particular terrain in a certain azimuthal direction can be compared directly with the elevation-angle statistics described above.

YT shows dramatically that a lofty antenna at a high QTH can often be *too* high for optimum communication at various times in the solar cycle. Figure 2 shows the computed elevation response toward Japan on 21.2 MHz for three different antennas at KM1H's location in New Hampshire, on top of an impressive hill. A single 120-foot-high four-element Yagi at KM1H would have a 6 dB disadvantage at a 10° elevation angle compared to a similar antenna mounted 60 feet over flat ground.

To optimize the elevation coverage for a particular direction, the operator has only a few options: (1) Change the antenna height for a single Yagi; (2) use stacked Yagis at various heights; (3) move the tower to a different location on your property or (4) move to a different location. *YT* shows that it makes sense to evaluate a prospective property before buying it!

Software for Transmission Line Evaluation

We also include with *The ARRL Antenna Book* a new program for the evaluation of transmission lines: *TLA*, or *Transmission Line, Advanced*. One beta tester dubbed *TLA* the "Swiss Army knife" of transmission line programs because of the many built-in tools. What's different about *TLA*, compared to its older brother *TL* (available in the 1997 *ARRL Handbook*)? It can analyze a transmission line from either end. *TLA* allows you to specify either the impedance at the output or at the input of the line. This can be done either as rectangular coordinates of resistance and reactance, or as the magnitude of impedance and the SWR—precisely what the popular Autek RF-1 RF Analyzer provides.

Figure 3 shows the main readout for a 100-foot-long 450-Ω ladder line, feeding a 100-foot-long center-fed flat-top dipole 50 feet above ground of average conductivity and dielectric constant. At 1.83 MHz, this antenna is electrically very short, and hence the feed-point impedance is extremely reactive: $4.5 - j\ 1673\ \Omega$. This puts quite a strain on the feed line, to put it mildly. *TLA* is also used to analyze the losses and the internal stresses on four networks commonly used in antenna tuners.

Software for Antenna Tuner Evaluation

Speaking of stressing an antenna tuner, did you see the product review of high-power antenna tuners in March 1997 *QST*?[2] It contained some eye-opening information, didn't it? The new *ARRL Antenna Book* also includes a program called *AAT*, short for *Analyze Antenna Tuner*. This program automatically cycles an antenna tuner network through 253 combinations of load resistance and reactance, for each of nine different amateur-band frequencies from 1.8 to 29.7 MHz. *AAT* creates a very comprehensive overview of the matching limitations in any particular tuner.

Propagation Prediction

For the last few years I've provided my club, the Yankee Clipper Contest Club, with customized propagation information for upcoming DX contests, using the *IONCAP* program. Figure 4 shows a roughly one-third-size snapshot of a printout of such a table using Microsoft Word.

The world has been divided up into a

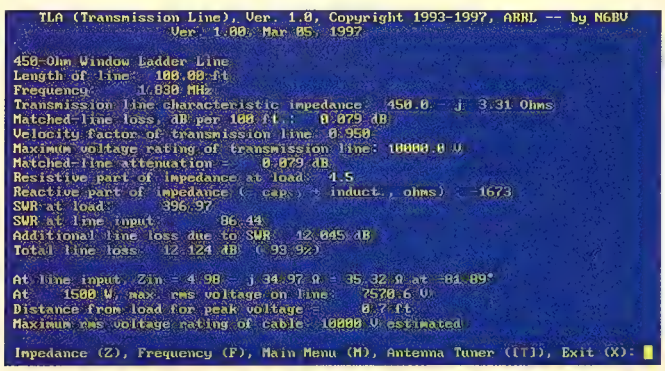


Figure 3—*TLA* on-screen display for a 100-foot-long 450-Ω ladder line feeding a 100-foot-long, center-fed flat-top dipole at 1.83 MHz. This antenna is 50 feet over ground with average conductivity and dielectric constant. The feed-point impedance is extremely reactive for this electrically short antenna. The SWR at the end of the transmission line is almost 400:1, leading to a staggering loss of 12.124 dB in the line alone! The peak voltage along the line, very close to the antenna, is 7570 V if fed with 1500 W.

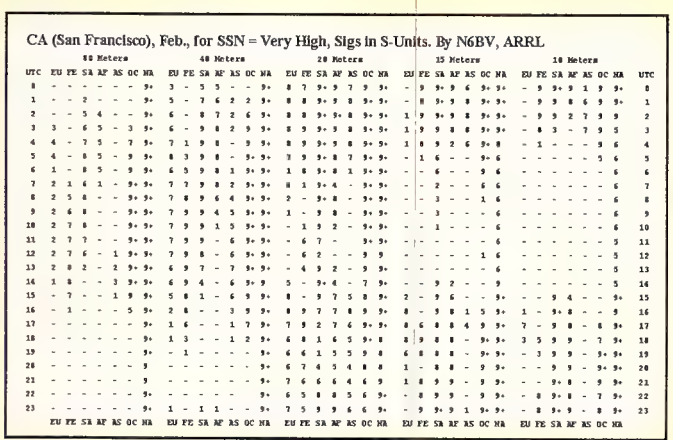


Figure 4—Snapshot, roughly 1/3-size, of propagation prediction table for path from San Francisco (W6) to the rest of the world. This is for the month of February during a Very High level of solar activity.

number of geographic areas, continental in scope. These areas were made up of *CQ* WAZ Zones: EU = Europe (Zones 14, 15, 16, 20 and 40), FE = Far East (Zones 19, 24, 25, 26 and 28), SA = Central/South America (Zones 7, 8, 9, 10, 11, 12 and 13), AF = Africa (Zones 33, 34, 35, 36, 37, 38 and 39), AS = central Asia (Zones 17, 18, 21, 22 and 23), OC = Oceania (Zones 27, 29, 30, 31 and 32) and NA = North America (Zones 1, 2, 3, 4, 5 and 6).

For each UTC hour, the strongest predicted signals, calibrated in S units, for any of the applicable zones in each amateur frequency band is shown in the table. The predictions were done on the basis of well-equipped stations running 1500 W of transmitter power at both ends of the circuit, and with 100-foot-high dipoles for 80 and 40 meters, three-element Yagis at 100 feet for 20 meters, and four-element Yagis at 60 feet for 15 and 10 meters.

If you have a more modest station, you would subtract 2 S units for a 20-meter dipole at 100 feet (instead of a three-element Yagi), or 3 S units for a dipole at 50 feet. If the other station is running 100 W rather than 1500, you would subtract 3 S units from his predicted signal strength. Take, for example, a VU2 running 100 W in Zone 22 who might be S5 if both of you had beams at 100 feet. He would be S2 if you had a high beam but he only had a 50-foot-high dipole. If you both had 50-foot-high dipoles, you might not be able to hear him at all unless your local noise level is very low!

Yagi Analyzer Software

Once again, Brian Beezley, K6STI, has provided his elegant *YA (Yagi Analyzer)* program for the 18th Edition. This software quickly and accurately analyzes the performance parameters for Yagi antennas. Included are ARRL-designed data files for a wide variety of different Yagi designs—ranging in boom length from 8 to 80 feet. These have been individually optimized to meet stringent performance criteria.

The Bottom Line

I've received numerous enthusiastic comments from beta testers telling me how delighted they are with the software and data bundled with this new *ARRL Antenna Book*. Now, let's be very frank: For $30, where else can you find really high quality software—plus a massive printed book, as a bonus? Or, looking at it from the other side, have you priced quality textbooks lately? Even if you're not a computer enthusiast, the printed book alone is a tremendous bargain!

Notes

[1]R. Dean Straw, N6BV, "So What's New in *The ARRL Antenna Book*?" *QST*, Sep 1994, pp 24-28.

[2]"*QST* Compares: Four High-Power Antenna Tuners," *QST*, Mar 1997, pp 73-77. QST

W1AW schedule

Pacific	Mtn	Cent	East	Sun	Mon	Tue	Wed	Thu	Fri	Sat
6 am	7 am	8 am	9 am					Fast Code	Slow Code	
7 am	8 am	9 am	10 am					Code Bulletin		
8 am	9 am	10 am	11 am					Teleprinter Bulletin		
9 am	10 am	11 am	noon							
10 am	11 am	noon	1 pm		Visiting Operator Time					
11 am	noon	1 pm	2 pm							
noon	1 pm	2 pm	3 pm							
1 pm	2 pm	3 pm	4 pm	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code
2 pm	3 pm	4 pm	5 pm	Code Bulletin						
3 pm	4 pm	5 pm	6 pm	Teleprinter Bulletin						
4 pm	5 pm	6 pm	7 pm	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code
5 pm	6 pm	7 pm	8 pm	Code Bulletin						
6 pm	7 pm	8 pm	9 pm	Teleprinter Bulletin						
6:45 pm	7:45 pm	8:45 pm	9:45 pm	Voice Bulletin						
7 pm	8 pm	9 pm	10 pm	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code
8 pm	9 pm	10 pm	11 pm	Code Bulletin						
9 pm	10 pm	11 pm	Mdnte	Teleprinter Bulletin						
9:45 pm	10:45 pm	11:45 pm	12:45 am	Voice Bulletin						

W1AW's schedule is at the same local time throughout the year. The schedule according to your local time will change if your local time does not have seasonal adjustments that are made at the same time as North American time changes between standard time and daylight time. From the first Sunday in April to the last Sunday in October, UTC = Eastern Time + 4 hours. For the rest of the year, UTC = Eastern Time + 5 hours.

❑ ***Morse code transmissions:***

Frequencies are 1.818, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.

Slow Code = practice sent at 5, 7½, 10, 13 and 15 wpm.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13 and 10 wpm.

Code practice text is from the pages of *QST*. The source is given at the beginning of each practice session and alternate speeds within each session. For example, "Text is from July 1992 *QST*, pages 9 and 81," indicates that the plain text is from the article on page 9 and mixed number/letter groups are from page 81.

Code bulletins are sent at 18 wpm.

W1AW qualifying runs are sent on the same frequencies as the Morse code transmissions. West Coast qualifying runs are transmitted on approximately 3.590 MHz by W6OWP, with K6YR as an alternate. At the beginning of each code practice session, the schedule for the next qualifying run is presented. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any) and complete mailing address. Send a 9×12-inch SASE for a certificate, or a business-size SASE for an endorsement.

❑ ***Teleprinter transmissions:***

Frequencies are 3.625, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz.

Bulletins are sent at 45.45-baud Baudot and 100-baud AMTOR, FEC Mode B. 110-baud ASCII will be sent only as time allows.

On Tuesdays and Saturdays at 6:30 PM Eastern Time, Keplerian elements for many amateur satellites are sent on the regular teleprinter frequencies.

❑ ***Voice transmissions:***

Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59 and 147.555 MHz.

❑ ***Miscellanea:***

On Fridays, UTC, a DX bulletin replaces the regular bulletins.

W1AW is open to visitors during normal operating hours: from 1 PM until 1 AM on Mondays, 9 AM until 1 AM Tuesday through Friday, from 1 PM to 1 AM on Saturdays, and from 3:30 PM to 1 AM on Sundays. FCC licensed amateurs may operate the station from 1 to 4 PM Monday through Saturday. Be sure to bring your current FCC amateur license or a photocopy.

In a communication emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

Headquarters and W1AW are closed on New Year's Day, President's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving and the following Friday, and Christmas Day.

By Eileen Lau, KE6VWU; Kai-Wai Chiu, KF6GHS; Jeff Qin, KF6GHY; John Davis, KF6EDB; Kent Potter, KC6OKH; and David Rutledge, KN6EK

High-Efficiency Class-E Power Amplifiers—*Part 2*

Class-E operation permits low-cost MOSFETs to develop considerable power.

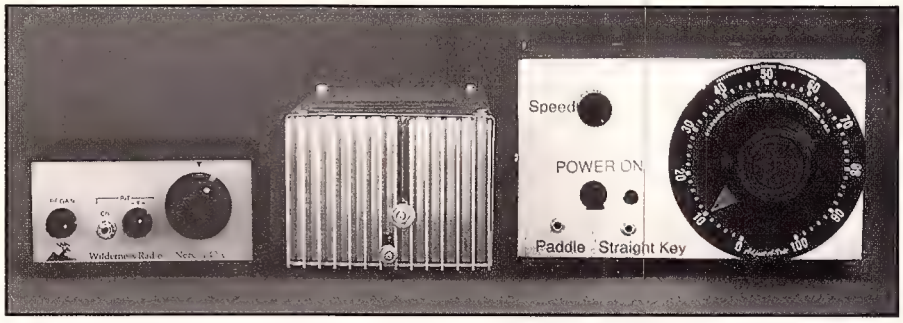
Last month[7] we talked about Class-E amplifier fundamentals and began construction of a 40-meter unit. Now we'll tackle the power supply, keyed-waveform shaper and develop some power.

A Keyed Power Supply

Nonlinear Class-E operation sharpens the CW keying envelope, causing annoying key clicks. To prevent this, we key the power supply to shape the supply voltage. A separate 4×7×12-inch (HWD) enclosure houses the dc supplies, a stretcher circuit that delivers a stretched pulse to the driver and a shaper that produces the shaped pulse for the amplifier. Figure 8 shows how these circuits connect.

So that the RF drive does not end before the shaping pulse, the keying pulse to the NorCal 40A driver is stretched a few milliseconds. The stretcher (Figure 9) takes a keyer's CMOS logic signal and provides a buffered keying waveform to the shaper and a stretched keying waveform to the NorCal 40A driver. Dc supplies (Figure 10) provide 12 V dc to run the ICs and 0 to 120 V dc for the amplifier. A wave shaper (Figure 11) gives this 0 to-120 V dc supply voltage a controlled rise and fall time to avoid key clicks. Figure 12 shows the keyed power supply with its cover removed.

There are other advantages to using a keyed power supply to control the output power. The amplifier power dissipation is low at all supply voltage levels, so that loss is kept low throughout a keying pulse. Because the keyed power supply also acts as a solid-state TR switch, a relay is not needed. This is because the supply voltage is zero except during key down. (This feature works well with the NorCal 40A, because it, too, does not use a relay for switching.) At zero voltage, the drain-to-gate capacitance in a MOSFET is quite large, and the signal from the antenna is fed through the amplifier with a loss of only about 7 dB. The NorCal 40A receiver sensitivity is excellent,[8] and a 7 dB signal loss does not hurt reception at all. A 7-dB loss degrades the MDS to −130 dBm, still far below typical 40-meter antenna noise levels of −90 to −110 dBm. On the positive side, with 7 dB attenuation, the receiver is less susceptible to intermodulation distortion from other signals in the 40 meter band. In addition, the amplifier reduces AM broadcast signals by about 20 dB. The 7-dB loss does need to be made up at the audio end. For this, we mount a 2-inch-diameter speaker in a cardboard mailing tube cut to



Transceiver, amplifier, and power supply for a 40-meter, 500-W station. The NorCal 40A transceiver driver is on the left, a 500-W amplifier is in the center and the power supply on the right. The amplifier's heat sink and transistor mounting screws are visible. The large dial controls the variable autotransformer, varying the RF output power.

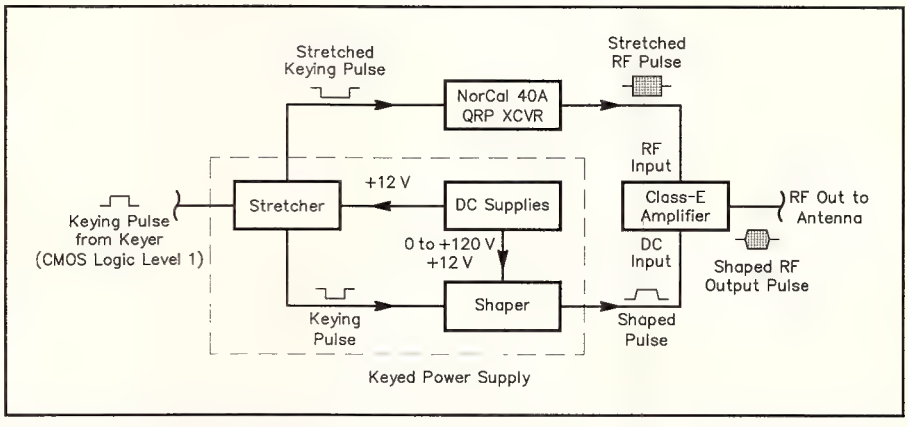


Figure 8—Block diagram showing the connections between the stretcher, dc supplies, shaper, NorCal 40A and the Class-E Amplifier. The stretcher, the dc supplies, and the shaper are in the keyed power supply. Power supply keying is done by a Curtis keyer IC (not shown) that provides a CMOS logic-level 1 during key down. The Curtis keyer IC and application note are available from MFJ Enterprises Inc, Box 494, Mississippi State, MS 39762, tel 800-647-1800, 601-323-5869, fax 601-323-6551; e-mail **mfg@mfjenterprises.com**; WWW **http://www.mhjenterprises.com**.(Keyer circuits using Curtis ICs can be found in recent editions of *The ARRL Handbook*.—*Ed.*)

[7]Notes appear on page 42.

resonate at 650 Hz for CW reception. This gives a sound level that is quite adequate.[9]

The Diplexer

For greater reduction of spurious emissions, we recommend following the amplifier with a band-pass diplexer (see Figure 13) to terminate out-of-band spurious components in a 50 Ω load.[10] Our diplexer (in a 3.5×6×10-inch [HWD] box) uses the equivalents of a 100-pF series capacitor, an 1800-pF shunt capacitor and air-wound inductors. Stretch or compress L2 to achieve minimum SWR. The measured loss of 40-meter signals was extremely low, only 4%. Our experience shows that a diplexer can reduce all spurious components to more than –55 dBc.

Tune-Up

Refer to Figure 3 in Part 1. There are two amplifier coil adjustments. First, with the cover on and the dc input off, L1 is set for minimum input SWR with full RF input. Typically, the SWR can be reduced to 1.5:1. If it cannot be brought below 2:1, try adding or subtracting a turn from L1.

Output power is peaked by stretching or squeezing L2. Note: For safety, the amplifier's cover should always be attached when the RF drive is applied. The cover also significantly lowers the inductance of L2. Be sure to turn off the supply voltage before you touch *any* amplifier parts! A high RF voltage will burn the skin. RF burns are deep and heal slowly. Having a keyed power supply helps here, because the amplifier supply voltage is zero except during key down.

Attach a dummy load and power meter to J2. With the RF input applied continuously, slowly increase the dc input voltage, while monitoring the gate and drain voltages using an oscilloscope with 10× high-impedance

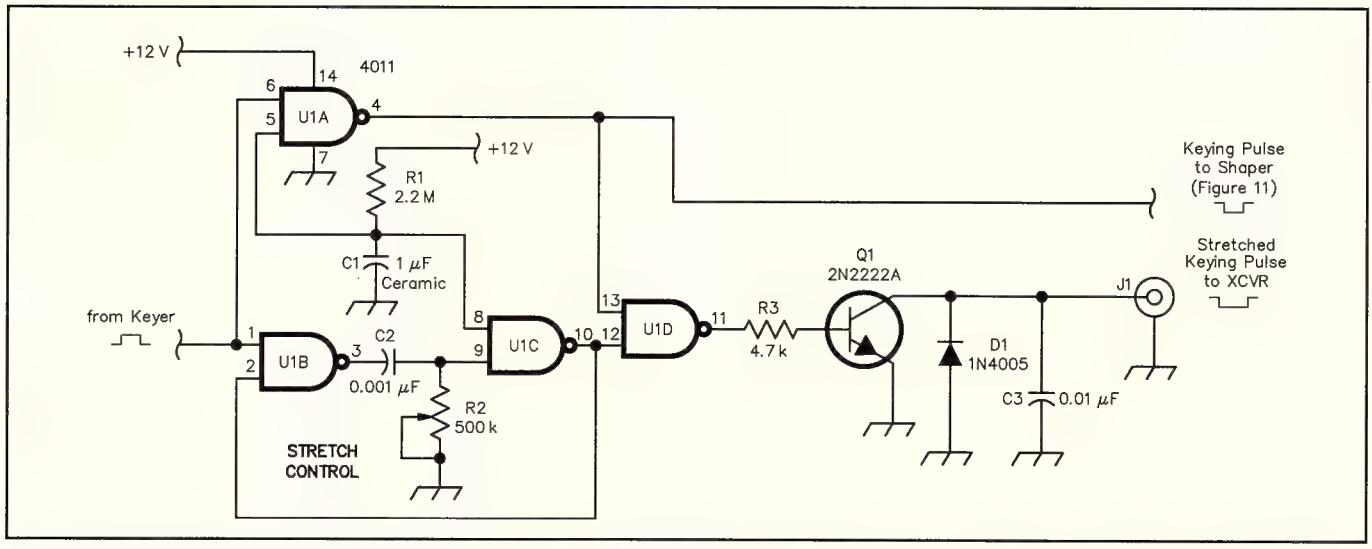


Figure 9—Stretcher circuit diagram. **NAND** gate A acts as a buffer and produces a keying pulse for the shaper. One input has an RC delay to prevent keying glitches when the power is turned on. Gates B and C are connected by an RC network that causes a pulse to be triggered on a falling edge. R2 is adjusted to ensure that the RF output from the NorCal 40A lasts longer than the shaping pulse. The components are assembled on perfboard.

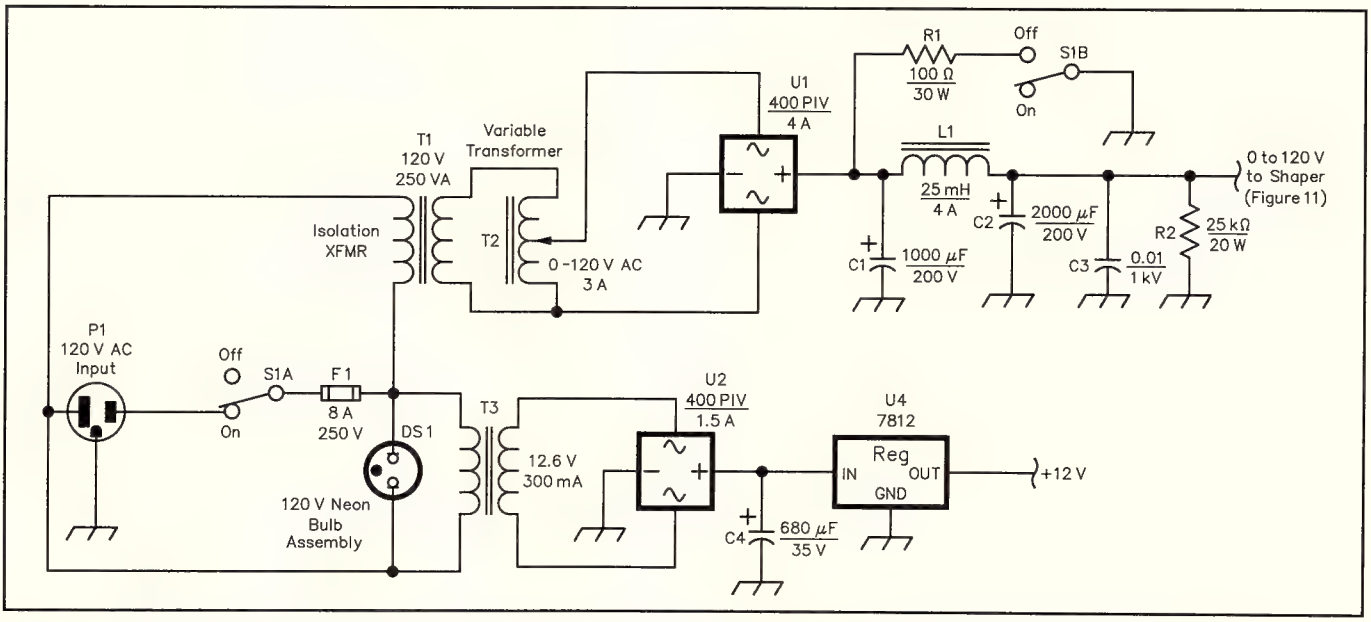


Figure 10—Dc supplies diagram. There are two isolated supplies: one with an unregulated 0 to 120-V output controlled by an autotransformer, and another with a +12-V regulated output. Two bleeder resistors help keep capacitor voltages at safe levels when the supply is turned off or its output reduced. The 4-A bridge rectifier is an RS404LR by Diodes, Inc, available from Digi-Key. The Panasonic 1000 and 2000-µF electrolytics in the filter are available from Digi-Key. The Stancor C-2686 25-mH choke is available from Newark. We scrounged the isolation transformer and variable autotransformer from old equipment. Look for them at swap meets, or purchase equivalents from Newark (Magnetek N55M 250-VA isolation transformer and the Staco 291 3-A variable autotransformer).

probes. (You should see waveforms similar to those in Figure 15, although the peak drain voltage should be about half of that in the figure.) The RF output should begin to rise. Increase the dc input until the forward RF output power is 25% of full power. Make sure the output SWR is 1.5:1 or less. Measure the dc input voltage, and adjust L2 to give 25% power at 60 V dc. Stretching L2 reduces its inductance and increases the output power, but usually lowers the amplifier's efficiency. Squeezing L2 reduces the output power and usually increases amplifier efficiency.

Increase the dc input voltage until the amplifier reaches maximum output power. The dc voltage should now be between 115 and 120 V, and the peak drain voltage of the RF-stage MOSFET should be between 380 and 420 V. Larger peak drain voltages run the risk of transistor failures. Lower voltages may indicate an excessive drain current, which can lead to a failure. If the voltage is too high, stretch the coils a bit more. If the voltage is too low, squeeze the coils. Check the RF drive and input SWR again. You may find that they have changed somewhat and that readjustment is needed. Measure the dc supply current and voltage, and calculate the amplifier efficiency to ensure that it is 85% or above. Use a 0.001-µF capacitor to bypass the voltmeter terminals because an RF voltage there can cause a significant measurement error. (In addition, you should realize that RF power meters often have error factors as high as 10%.)

Keyed-Waveform Shaping

The keying envelope is controlled by the three potentiometers in the shaper and stretcher circuits. R3 in the shaper circuit sets the rise time, R4 sets the fall time. R3 also helps control the power supply droop as

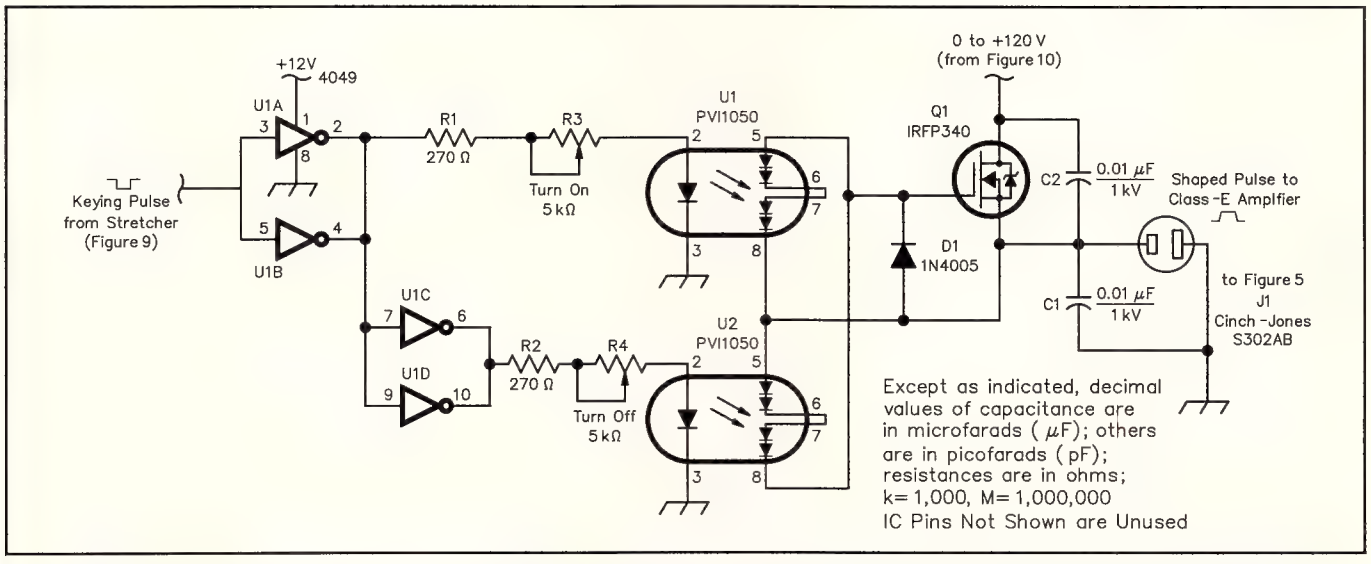


Figure 11—Shaper circuit diagram. A pair of optically isolated MOSFET drivers (type PVI1050) turn Q1 on and off to bring the supply voltage up and down. Keying waveform rise and fall times are adjusted by R3 and R4, which control the current to each MOSFET driver. The 270-Ω resistors limit the LED current to a safe level. The **TURN-ON** potentiometer is also used to keep the overshoot from the unregulated power supply to a reasonable level. D1 prevents Q1's gate voltage from drifting negative. C1 and C2 are RF bypasses. To keep the supply voltage from appearing across exposed contacts, a female socket is used at J1. All components are available from Digi-Key. Point-to-point wiring on perfboard is used.

Figure 12—The keyed power supply with the cover removed, viewed from the side. T1 is mounted on the back plate, along with the fuse and connectors for the dc output, a keying line to the NorCal 40A and the ac line input. The **TUNE** switch keys the amplifier for testing. The variable autotransformer is on the left, mounted to the front panel. In the center foreground, mounted to the base plate, is L1, the 25-mH choke. Mylar sheets are taped to the perfboards for electrical isolation. The large components are attached directly to the box. The IRFP340 is mounted on the bottom of the box using a Berquist K10-104 Kapton insulating pad, #6-32 screw and a torque of 10 inch-pounds. The other shaping circuit components are mounted on perfboard. Layout is not critical.

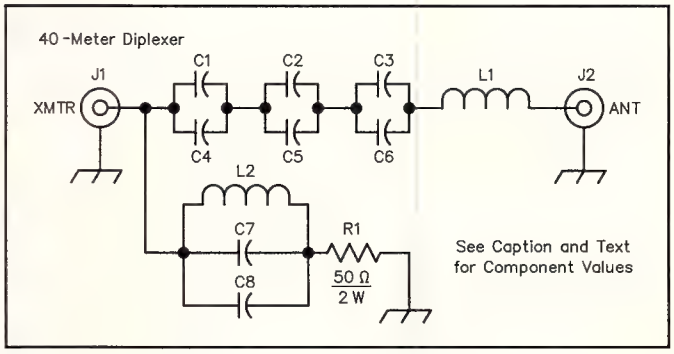


Figure 13—Schematic of our diplexer. It uses six 150 pF capacitors, two 910-pF capacitors and air-wound inductors made of 3/16-inch-wide copper tape (see Note 1).

C1-C6—150 pF, 1 kV mica 5%-tolerance (Cornell Dubilier type CDV19; available from Newark Electronics, see Note 1)
C7, C8—910 pF (same type as above)
L1—24 turns of 3/16-inch-wide copper tape, 1 3/8 inch ID; see Note 1.
L2—4 turns of 3/16-inch wide copper tape, 1 inch ID; see Note 1.
R1—50-Ω, 2-W (approx) termination, Jameco part number 71458; available from Jameco Electronics, 1355 Shoreway Rd, Belmont, CA 94002, tel 415-592-8097; fax 415-592-2503 and 415-595-2664)

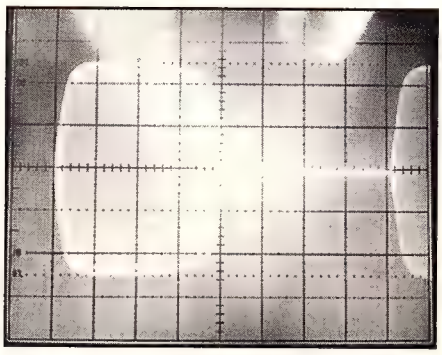


Figure 14—Keying waveform of the 500-W amplifier at 30 WPM. The horizontal axis is 10 ms per division. The rise and fall times are about 3 ms.

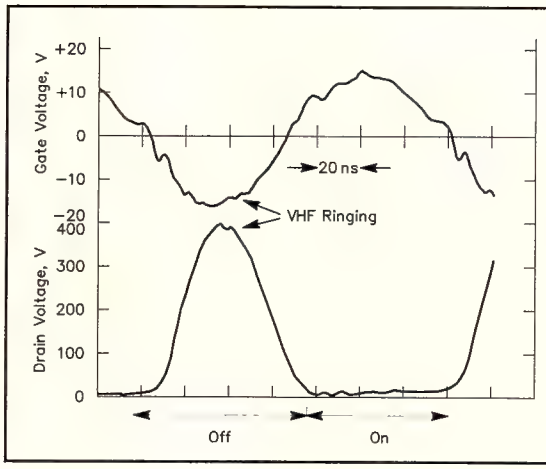


Figure 15—Drain waveform and ringing. Oscilloscope trace of the gate and drain voltages of the 300-W amplifier with 3 W drive. The dc supply voltage is 120 V; the input SWR is 1.6:1. Time scale is 20 ns per division; the transistor off and on times are shown. The transistor is off when the gate voltage is below the threshold, typically 4 V, and on when the gate voltage is several volts above the threshold. Peak gate voltage is 16 V, and the peak drain voltage is 400 V, safely within the manufacturer's ratings of 20 and 500 V, respectively.

the amplifier is keyed. R2 of Figure 9 determines the stretch in the pulse that keys the NorCal 40A, so that it does not stop transmitting before the end of the shaped pulse. We recommend using a keyer with adjustable weighting to offset the pulse stretching. The potentiometer settings interact somewhat, and there are variations at different sending speeds, so it is best to set them at the speed you commonly use. Adjust the controls for rise and fall times between 2 and 5 ms, and for a smooth keying envelope. Figure 14 shows keying at 30 WPM with rise and fall times of about 3 ms.

VHF Ringing

In many Class-E amplifiers, ringing in the VHF range can be seen on the gate and drain waveforms (Figure 15). This ringing can be quite pronounced, with bumps several volts high on the gate or drain or both. The bumps disappear when the RF input is removed, and that is why we refer to this as *ringing* rather than *oscillation*. We have compared measured spectral plots with *PSPICE* simulations and believe that the waves are driven by the sudden turn-on and turn-off of the transistor, acting rather like the gong of a bell.

We notice two distinct time periods and frequency ranges for the ringing. During the time the transistor is on, the ringing frequency is about 80 MHz. This appears to be a resonance of the external drain capacitor combined with the internal inductance of the capacitor and the transistor and may indicate a mismatched load. The on-ringing is usually small if the load is matched so that the drain voltage comes smoothly to zero before the transistor turns on.

The ringing while the transistor is off covers a broad range of frequencies—from 130 to 210 MHz. If the output low-pass filter is removed, the ringing can be seen easily on a spectrum analyzer at levels between −40 and −60 dBc. The off-ringing appears to be caused by a resonance of the external drain capacitor and its internal inductance, together with the transistor's internal drain capacitance and its inductance. The internal drain capacitance varies greatly with the drain voltage, so that the frequency is modulated as the drain voltage rises and falls. The low-pass filter reduces these harmonics to the −70 to −80 dBc range.

On the Air

The amplifiers meet the FCC requirements for spectral purity [confirmed in the ARRL Lab—*Ed.*]. NorCal 40A designer Wayne Burdick, N6KR, emphasizes that it is important to correctly tune the bandpass filter following the transmit mixer to minimize spurious emissions from the NorCal 40A.[11]

These amplifiers are excellent for chasing DX, schedules and "ragchews," particularly at this low point of the sunspot cycle. The amplifiers require no warm-up, no tune-up, and produce no fan or relay noise. We can vary the power from 1 W to full power via the variable autotransformer. The antenna SWR should be 1.5:1 or better because the amplifier is not protected against large mismatches. With a high SWR, the transistor will probably overheat. Check the dc voltage when the amplifier is delivering full power to the antenna to ensure that it remains between 115 V and 120 V. Readjust the coils if the voltage is too high or too low.

Our most common problem has been a poorly mounted PA transistor. If the transistor is not flat against the heat sink, heat transfer is poor and the transistor becomes quite hot; efficiency suffers (becoming usually less than 85%) and the amplifier may not reach full power. The output power may also drift downward, a sign that the transistor temperature is increasing and that the transistor is under stress.

Component temperature can be a good diagnostic tool. For the 500-W amplifier, our experience is that for CW QSOs longer than 30 minutes, the temperature of C3, C5 (Figure 5) and the heat sink rises to about 60° C. For the 300-W amplifier, the heat-sink temperature is about 50° C. This is hot to the touch, and it can be checked with a lab thermometer. The temperature will vary according to your operating style, and if the temperature is higher than you like, you can add a fan.

The Future

We see room for improvements: protection against antenna mismatches and employment of an inexpensive keyed *switching* power supply that is as lightweight as the amplifiers. Finally, it would be interesting to develop Class-E amplifiers for the other bands. We have built a 250-W amplifier for the 20 meter band that exhibits an efficiency of 88% with 10 W drive. We believe that Class-E amplifiers provide amateurs with good building challenges and operating fun at modest cost.

Acknowledgments

This work began as senior theses by Joyce Wong and Meng-Chen Yu at Caltech, and many of their ideas appear here. John Davis was supported by a scholarship from the James Irvine Foundation and the Army Research Office. Eileen Lau, Kai-Wai Chiu, and Jeff Qin received Caltech Summer Undergraduate Research Fellowships funded by the ETO Corporation and the Caltech Gates Grubstake Fund. We appreciate the help from all the people at the ETO Corporation, particularly Dick Ehrhorn, WØID; Don Fowler, W1GRV; Tim Coutts; Chip Keen and Frank Myer. Mitsu Sakamoto, JA4FVE, of Kurashiki, Japan, sent us off-the-air recordings over the Internet. We would like to thank Wayne Burdick, N6KR; Wes Hayward, W7ZOI; and Bill Bridges, W6FA, for their advice.

Notes

[7]Eileen Lau, KE6VWU, et al, "High-Efficiency Class-E Amplifiers—*Part 1*," *QST*, May 1997, pp 39-42. The amplifier enclosures are $3^1/_8 \times 4^1/_8 \times 7^1/_8$ HWD.

[8]Rick Lindquist, KX4V, "Low-Power Transceiver Kits You Can Build," Product Review, *QST*, Jun 1996, pp 45-50.

[9]See J. B. and R. V. Heaton, "An Electro-Acoustic CW Filter," *QST*, Apr 1983, pp 35-36; Wally Millard, K4JVT, "A Resonant Speaker for CW," Hints and Kinks, *QST*, Dec 1987, p 43; and Richard Clemens, KB8OAB, "More on Resonant Speakers," Hints and Kinks, *QST*, Jan 1989, p 37.—*Ed.*

[10]David Newkirk, WJ1Z (now W9VES), and Rick Karlquist, N6RK, "Mixers, Modulators, and Demodulators," *The 1996 ARRL Handbook*, Chapter 15, p 15.22.

[11]Telephone conversation with Wayne Burdick. This tuning is done by carefully adjusting C50 to peak the output power.

By Darrel Emerson, AA7FV, G3SYS

Try a Twelfth-Wave Transformer

Have you heard of "twelfth-wave transformers"? They perform like common quarter-wave transformers, but use less cable and seldom need the odd-ball impedances demanded by quarter-wave transformers.

The quarter-wavelength (λ/4) transformer is well known as a convenient matching device between two resistive impedances. It requires an electrical λ/4 of cable with a characteristic impedance equal to the geometric mean of the two impedances being matched. For example, to match a 50 Ω impedance to a 75 Ω cable requires a λ/4 of cable of characteristic impedance 61.2 Ω.

$$Z_0 = \sqrt{50 \times 75} = 61.2\Omega \qquad \text{(Eq 1)}$$

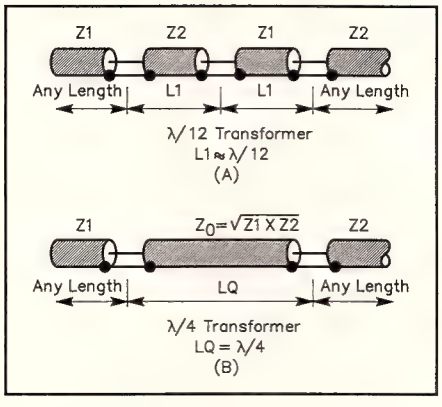
The twelfth-wave (λ/12) transformer performs the same function, but can avoid the need for cable with a nonstandard characteristic impedance. The transformer uses two lengths of cable (approximately λ/12 each), one with the source's characteristic impedance and one matched to the load's impedance. That is one length of 50 Ω and one length of 75 Ω cable for the example in Equation 1.

Matching Impedances with Transmission-Line Transformers

Almost all standard books on radio theory, such as *The ARRL Handbook*,[1] describe the need to match different impedances, and provide the formulas for impedance transformations using transmission lines. For an excellent discussion of impedance transformations with coaxial cable or other transmission lines—including the effects of cable losses—read William Sabin's *QEX* article.[2]

Recently, thanks to the cable-television industry, quantities of high-quality, low-loss 75 Ω coaxial cable have become available almost for the asking. Most amateur equipment that operates from HF to UHF and beyond is designed for a 50 Ω load impedance. For many purposes, the resulting 1.5:1 SWR (if the load is matched to the 75 Ω cable, which connects to a 50 Ω line without matching) may be insignificant—only 4% of the power is reflected. However, some transmitters have protection circuits on their output stages that reduce the output power, even with a modest 1.5:1 mismatch.

The λ/4 transformer provides one way of matching precisely, say, a transmitter designed for a 50 Ω load into 75 Ω cable. The transformer is very broadband. Unfortunately, the 61.2 Ω cable needed for the transformer may be difficult or impossible to find. Especially for VHF and UHF, amateurs have sometimes constructed their own cable for the matching section, using sections of copper or brass tubing and rods to make the necessary 61 Ω characteristic impedance.



The λ/12 transformer offers an attractive alternative. It uses only cables having characteristic impedances equal to the impedances being matched. To match 50 Ω and 75 Ω impedances, one λ/12 piece is 50 Ω, the other 75 Ω. Chances are good that you have cable of these two impedances on hand. In the title figure, A shows the general arrangement for the λ/12 transformer. Compare that with B, which shows the better-known λ/4 transformer. Losses in the short matching cables are assumed to be negligible.

The λ/12 transformer is not a new idea. It was first described in detail by Bramham in 1961.[3] It is an important special case of series-section matching, which Frank Regier, OD5CG, presented in 1978.[4,5] The λ/12 transformer is a very simple and useful concept that does not seem to be well known in Amateur Radio circles.

How Long is a Twelfth?

Strictly speaking, the length of each short cable should be slightly shorter than λ/12, and the precise length depends on the ratio of impedances being matched. In practice, the shortening is often insignificant, but Figure 1 shows the precise length of each short cable. *The ARRL Handbook* and other references give the equations to calculate the complex impedance at one end of a transmission line, given the line length and the attached impedance at the other end of the line. The precise lengths of cables for the λ/12 transformer have been calculated simply by solving these equations for the two-step complex impedance transformation. If B is the ratio of impedances (Z1/Z2) to be matched by the transformer, the precise electrical length L (in wavelengths) of each short cable in the transformer is given by:

$$L = \frac{\arctan\sqrt{\dfrac{B}{B^2+B+1}}}{2\pi} \qquad \text{(Eq 2)}$$

This equation assumes the arctan function returns an angle in radians. If it returns an angle in degrees, change the 2π in the denominator to 360. Figure 1 is a plot of L as a function of the ratio B. Note that the equation gives the same answer whether B is the ratio of the higher to lower impedance (ie, B > 1) or lower to higher (B < 1). As B approaches 1, L approaches λ/12. Even for a ratio of 3:1, L is only about 15% shorter than a true λ/12; the transformer bandwidth is sufficiently broad that this difference will often be insignificant. The operation of the transformer may be verified easily with the aid of a Smith Chart, or with any computer program[6] that calculates transmission-line impedance transformations.

Bandwidth

For both λ/4 and λ/12 transformers, the match at the design frequency is theoretically perfect. The frequency response of both transformers is very broad, with the λ/12 design being comparable to that of the λ/4 version. Figure 2 shows the SWR obtained from using the λ/12 transformer to match various ratios of resistive impedances up to 4:1, at frequencies away from the design frequency. Figure 2A shows frequencies from dc to 50% higher than the

[1]Notes appear on page 44.

design frequency. Figure 2B shows a close-up of the performance within ±15% of the design frequency.

An Example

The λ/12 transformer can match any ratio of resistive impedances. Let's consider matching a length of 75 Ω coax to a 50 Ω load, at 50 MHz. This requires two short pieces of coax—one 75 Ω and the other 50 Ω—as the matching transformer.

The ratio of impedances is 75:50 or 1.5:1. From Figure 1 or Equation 2, the optimum length for each short cable is 0.0815 wavelength, only two-thousandths of a wavelength less than λ/12. At 50 MHz, the wavelength is 6 meters, so the precise electrical length is 0.489 meter. This electrical length must be multiplied by the cable's velocity factor (VF) to obtain the physical length. When VF equals 0.66, the physical length is 0.323 meter or 12.7 inches. For this example, the value of L1 in the title figure is 12.7 inches. (A velocity factor of 0.66 is typical for coax with solid-polyethylene dielectric.)

The complete transformer consists of 12.7 inches of 75 Ω cable connected to the 50 Ω load, with 12.7 inches of 50 Ω coax between the 12.7-inch 75 Ω cable and any length of 75 Ω cable. At the transmitter end, the 75 Ω cable connects to another short 50 Ω section, then a short 75 Ω cable and finally to the 50 Ω transmitter. The match at 50 MHz should be perfect, with the fractional bandwidth as shown in Figure 2 for a 1.5:1 transformation ratio. The wide bandwidth shows that the tolerances are very loose; an error of even an *inch* in cutting the nominal 12.7-inch-long sections would barely be noticed.

Conclusions

In almost all circumstances, the λ/12 transformer may be used to match different impedances in place of the better known quarter-wave transformer. The transformer combination, a little under one-sixth wavelength in total length, is always shorter than a quarter-wave transformer. It is especially convenient when matching cables of different characteristic impedance to each other because the cable sections are readily available. A λ/12 transformer can match any reasonable number (N) of equal-impedance feeders; the necessary cable section (Z_0/N) can be made from N parallel-connected cable sections. The only minor disadvantage—compared to a quarter-wave transformer—is that one more cable joint is required, but the convenience of using lines with standard impedances compensates for that unless the connectors are unusually lossy or expensive.[7]

References

[1]*The ARRL Handbook for Radio Amateurs*, any edition, look for the chapter on "Transmission Lines." The 1997 edition (Order No. 1743) is $38 plus $6 shipping/handling. ARRL publications are available from your local ARRL dealer or directly from ARRL. Mail orders to Pub Sales Dept, ARRL, 225 Main St, Newington, CT 06111-1494. You can call us toll-free at tel 888-277-5289; fax your order to 860-594-0303; or send e-mail to **pubsales@ arrl.org**. Check out the full ARRL publications line on the World Wide Web at **http://www.arrl.org/catalog**.

[2]William E. Sabin, WØIYH, "Computer Modeling of Coax-Cable Circuits," *QEX*, Aug 1996, pp 3-10. Also see Edward Farmer, AA6ZM's "Let's Talk Transmission Lines," on p. 57 of this issue.

[3]B. Bramham, "A Convenient Transformer for Matching Coaxial Lines," *Electronic Engineering*, Vol 33, Jan 1961, pp 42-44.

[4]Frank A. Regier, OD5CG, "Series-Section Transmission-Line Impedance Matching," *QST*, Jul 1978, pp 14-16. Much of this article is reproduced in *The ARRL Antenna Book*; see Note 5.

[5]R. Dean Straw, N6BV, Ed, *The ARRL Antenna Book*, 18th edition (1997), pp 26-4 to 26-5 and 28-12 to 28-14. (Order No. 6133; $30 plus $5 shipping and handling. See Note 1 for ordering information.)

[6]*TL.EXE* software by R. Dean Straw, N6BV, is available from the ARRL "Hiram" BBS (tel 860-594-0306), or the ARRL Internet ftp site: **oak.oakland.edu** (in the **/pub/hamradio/arrl/qst-binaries** directory). It is also included on the disk that accompanies recent editions of *The ARRL Handbook*. (See Note 1 for ordering information.)

[7]Connectors of differing impedance seldom mate without damage. Use connectors of a single characteristic impedance throughout the system. You may need to modify the conductors to fit the connectors, or simply make coaxial connections without connectors: Fold back the braid, solder the center conductors, replace the braid and solder (Make connections to aluminum shields via suitable hardware and a solder lug.)

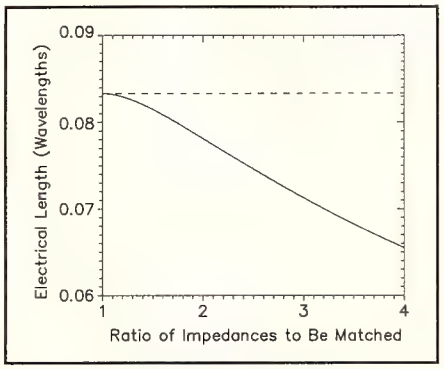


Figure 1—The precise electrical length of each short cable in the transformer depends on the ratio B shown in Equation 2. This is a graph of that equation.

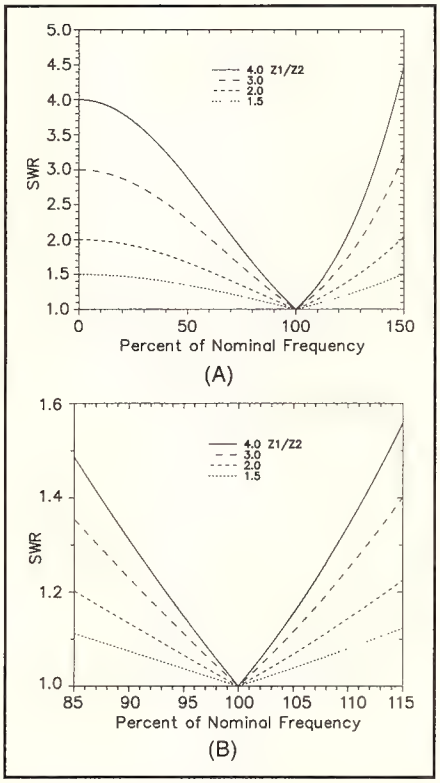


Figure 2—The bandwidth of the λ/12 transformer. A shows the resulting SWR for frequencies from dc to 1.5 times the design frequency and for (resistive) impedance-transformation ratios of 1.5, 1.0, 3.0 and 4.0. B gives a closer look at the region within ±15% of the design frequency.

Darrel Emerson was first licensed in 1964 as G3SYS, and still holds that call sign. He holds a BA in natural science from the University of Oxford, and a PhD in radio astronomy from the University of Cambridge, England. After spending several years working in Germany and France, he moved to Arizona in 1986, becoming AA7FV. He now works for the National Radio Astronomy Observatory in Tucson, Arizona, working primarily with the 12-meter-diameter millimeter-wave radiotelescope at Kitt Peak. Most of Darrel's Amateur Radio activity involves listening for very weak signals of all kinds; CW is his preferred operating mode. Darrel lives at 3555 E Thimble Peak Pl, Tucson, AZ 85718. You can reach him by e-mail at **aa7fv@amsat.org** *or on Compuserve as member number* **74010,2230**.

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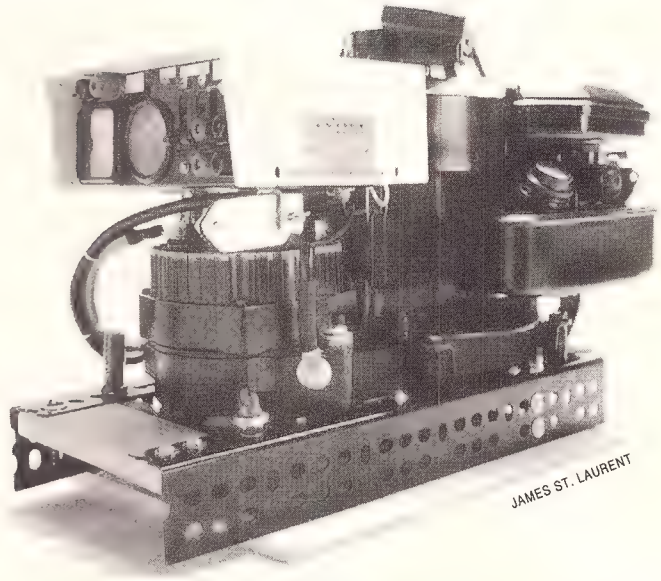
By Yaniko Palis, VE2NYP

The 12 Volt Pup: A DC Generator You Can Build

Grab a lawn-mower engine and an alternator to build a great 50 A power supply for Field Day or . . .



The 12 Volt Pup on its plywood platform and ready to go. Does it look a little like Number Five from the movie, *Short Circuit?*

Field Day weekend is the best event of the year! I have always loved wilderness camping and almost any other adventure in the wide-open spaces. Coincidentally, my work often involves setting up all kinds of gear at remote locations for short periods of time—sort of a large-scale version of Field Day. Because of these two interests, Field Day has been my favorite event ever since I became a ham, six years ago. Now, thanks to what I have named "The 12 Volt Pup," I can easily generate enough power to operate a 100 W transceiver and plenty of accessories at almost any location I choose.

Generating power at remote locations is burdensome, in both equipment weight and cost. The Pup weighs about 45 pounds without a battery; so one person can handle it fairly easily. All told, expect to tote anywhere between 70 and 100 pounds, including batteries, fuel, oil and cables. If needed, you can easily disassemble the Pup into assemblies weighing less than 20 pounds each for backpacking.

The 12 V Pup combines a standard 3.5 horsepower lawn mower engine with an automotive alternator. These two components mount face downward onto two parallel, heavy duty, L-shaped steel rails, as shown in Figure 1. Spacers between the components and the rails precisely locate the pulleys and belt within the two steel rails. (See Figure 2.) Thus, the unit can rest on any appropriate flat surface. The engine takes a pulley for standard V belts, which makes it compatible with the alternator. Add a car battery and presto! You're in business. This design is amazingly simple.

An emergency version of this device could be jury rigged in an hour and a half. All you really need is a pulley for the engine, the right size belt and two angle iron rails fitted with simple little mounts. Of course, you must also be willing to critically amputate your car and lawn mower! I decided to build a dedicated unit instead; it sports a control box and it cost me only $250 for all new parts. If you can scrounge up used parts, $125 should get you all the basic ingredients. My Pup took about four days to create.

It's great to use the Pup with two or more deep-discharge lead-acid batteries. You can operate with power from one battery while charging the other. Because the Pup will probably charge a battery much faster than you would normally consume the stored energy, the generator may be switched off perhaps half of the time. This conserves fuel and reduces noise pollution.

You could also connect a load directly to the generator—as long as there's a battery connected across the load to stabilize the alternator's output. The engine's little governor works just fine, readily adapting the throttle to changing load conditions. While idling, the Pup provides about 6 A for normal battery charging. A 50% throttle setting produces about 30 A and ensures proper governor performance under varying loads.

Uses for the Pup go far beyond powering radios: I have inspired a friend to make one for his remote mountain cabin; it's a reliable supplement to his solar panels. A Pup can charge vehicle batteries in the field. The Pup is also an excellent auxiliary power unit for an RV or at the race track, for deluxe golf carts and—my most ingenious use thus far—to charge batteries for electric trolling motors. "Ahoy, mateys! Let's visit a maritime mobile, haar!" I'm sure you'll find a use for a VE2NYP 12 Volt Pup.

Voltage Regulation

Cars do not run on 12 V, and regulated alternators are inherently unstable. Without some additional regulation, even a so-called "internally regulated" alternator will likely put out ugly inductive spikes at a dangerous 20 V, or more. Without other provisions to condition the output, a sizable lead-acid battery is essential; it should stabilize the output to a ripple-free 14.5 V.

The Control Circuit

The control box that I built is very simple. (See Figure 3.) The entire circuit is protected by an internal, automotive, 50 A automatic-reset circuit breaker.[1] The two auxiliary outputs are each protected by 30 A breaker switches. Even with these breakers, this sys-

[1]Notes appear on page 48.

JAMES ST. LAURENT

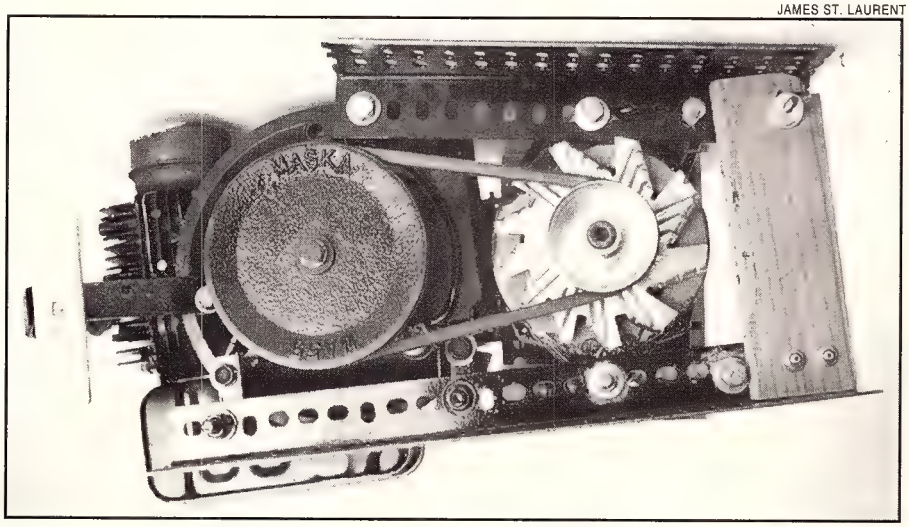


Figure 1—A bottom view without protective shields indicates the simplicity of the basic design. An engine bracket is visible at the left end of the lower (front) rail. The slot to mount the alternator (small pulley with fan) is in the upper (rear) rail. The Pup has wooden handles at each end for carrying.

JAMES ST. LAURENT

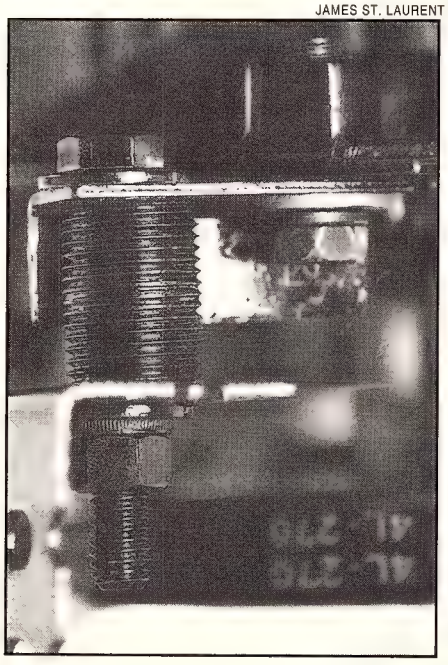


Figure 2—One of the two small engine brackets is above the pipe-coupling spacer. The engine is at the upper right, the front rail at lower left. See Figure 4 for mechanical details.

Partial Parts List for the 12 V Pup:

Motor (1)—(See Figure 4.) After searching for a used engine, I bought a new, no frills lawn mower (for $99) and kept the engine. Recent models have a safety lever connected to a **KILL** switch on the engine that grounds a *neutralizing wire* to stop the engine. This neutralizing wire connects to the control box ignition switch and protection circuit.

Alternator (1)—(See Figure 3.) The one I used is modified as suggested by the folks at a large alternator-remanufacturing company. They rewound a standard alternator with fewer turns so that its internal regulator activates more often (50 A output). A modified unit should cost $65 to $85. Any standard internally regulated alternator with an internal charge controller should be fine, especially for charging automotive batteries. (A used alternator is worth $15 to $30.)

Motor Pulley (1)—Get one sized for standard **V** belts. Its rim diameter should be twice that of the alternator's pulley. This makes the alternator turn twice as fast as the engine. I used a 5½-inch-diameter pulley. It's a big blessing that the engine shaft's dimensions are standard in every way. A common steel pulley fits right onto the engine's ⅞-inch shaft and accepts a standard locking key (3/16 inch wide by ⅛ inch deep).

V Belt to fit the pulleys, likely to be somewhere between 27 and 30 inches long; see text.

Storage Battery (1)—12 V lead-acid battery, 15 Ah or greater. Automotive or motorcycle batteries work, but a deep-discharge battery that tolerates fast charging is best. (Gel cells require a closely controlled charging regimen.)*

Steel rails (2) of **L**-shaped angle iron. This material is commonly used to support heavy-duty, industrial-grade storage shelves. It is perforated with rows of holes that ease assembly, provide ventilation and reduce its weight. The flanges should be at least 2¼×1½ inches. The front rail is 18 inches long; the back rail is 14 inches long.

Motor Brackets (2)—Heavy-duty 1×1-inch angle iron. See Figure 4.

Hardware (Nuts, bolts and spacers—all of which may vary):

(3) Engine-mount bolts, ⅜×16×2½ inches long

(3) Spacers, ¾-inch-diameter, 1¼-inches-long steel pipe couplings. These spacers place the engine pulley in the same plane as the alternator pulley. Buy longer couplings and/or shorten them as needed to accurately align the two pulleys.

(2) Alternator mounting bolts to fit your alternator.

*The regimen is described in "A New Chip for Charging Gelled-Electrolyte Batteries," by Warren Dion, N1BBH, in *QST*, Jun 1987, pp 26-29.

tem is as hazardous as that of a car: Shorting the battery, alternator or internal wiring will cause a *big* explosive spark. (They might hear it in Calcutta, but we no longer send code like this!) Carefully avoid electrical shorts at all times—*especially* when handling the battery cables.

To filter the alternator's output, I installed a 7700 µF electrolytic capacitor across it. The capacitor absorbs the output spikes, leaving a rounded reverse-ramp wave as ripple at 0.40 V (a barely tolerable 3.5%). A 6-W panel lamp acts as a minimum load that protects the battery against overcharging. D1 is a high-current blocking diode. It prevents battery discharge through the lamp and reduces the voltage at the battery to about 13.8 V. I also built a very simple protection circuit that stops the engine should the output exceed 15.5 V (16.0 V peak ac).

During its brief life as a prototype, I have already received many good suggestions on how to improve my control box. For instance, one could stay on an automotive theme and use a ballast resistor, solenoid and an ignition relay to disconnect the battery. You could use a heavy-duty headlight switch with an internal circuit breaker for the power switch.[2] All this is to say, the control-box circuit that I show here is only one of many possibilities—you're welcome to improvise!

Finally, I recommend that you study the unit's output with an oscilloscope to be certain that your valuable equipment won't be damaged if the battery is disconnected while you are running the Pup. Also, some 12 V-only devices might be damaged by the 13.8 V dc that this device normally generates. [Most equipment built for automotive use is rated to +15 V.—*Ed.*]

Potential Hazards

There are mechanical dangers from the belt, pulleys and other moving parts. It is *your* responsibility to install adequate mechanical shields to prevent bodily harm. The photos show some metal shields and a plywood base that enclose the moving parts. Cut and fit similar shields to your Pup when the main construction is done. Keep fingers, hair, clothes, etc, completely away from all moving parts.

As with all combustion-powered generators, stray sparks may ignite the fuel.

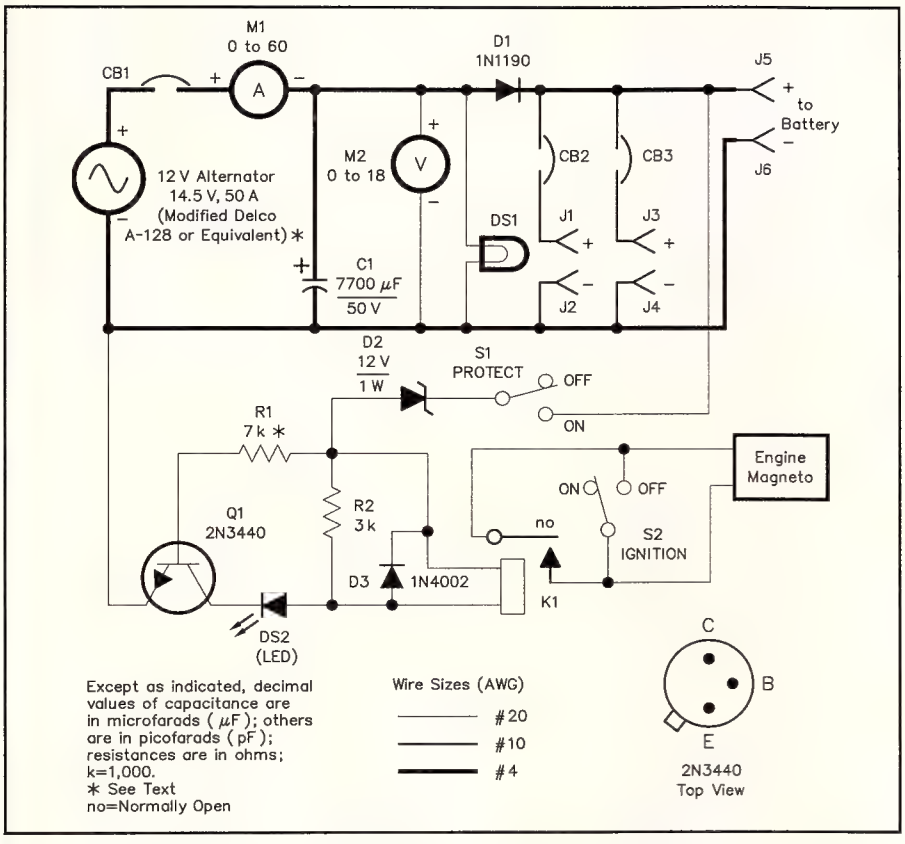


Figure 3—Control box schematic. Equivalent parts may be substituted for those shown. Many of the parts that carry large currents are not available from typical electronic-part suppliers. You'll have better luck at auto-part stores and local electrical-supply shops.

DS1—Automobile panel lamp, 12 V, 6 W, with socket and switch
C1—7700 µF, 50 V aluminum electrolytic
CB1—50 A automotive automatic-reset circuit breaker (from author's junk box; see Note 1)
CB2, CB3—30 A dc circuit breaker switches (65 V dc, 37.5 A trip, No. UPL1-1 from Philips Technologies Airpax Protector Group, 807 Woods Rd, Box 520, Cambridge, MD 21613-0520; tel 410-228-1500, fax 410-228-3456)
J1-J4—30 A terminals or connectors (builder's choice)
J5, J6—50 A terminals or connectors (builder's choice, look at your car's alternator connectors for ideas)

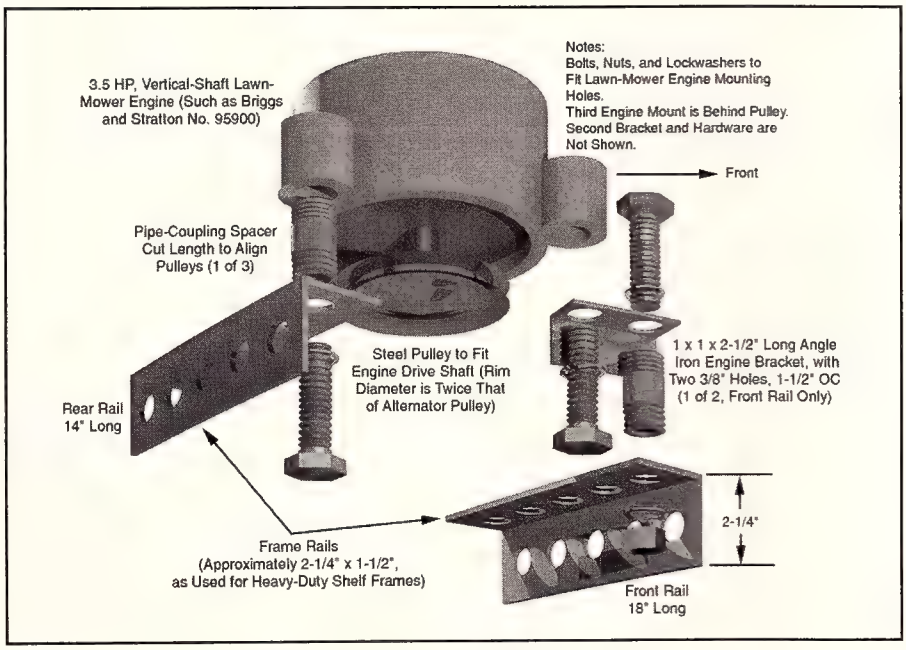


Figure 4—A pictorial of the engine mounting details.

Stop the engine to refuel, and don't start it again until any spills have evaporated. Keep all cables, connectors, switches and relay contacts away from the fuel tank, and use this device only in well-ventilated areas. Closely follow *all* of the engine manufacturer's warnings.

Construction

The exact configuration of your Pup will depend on the actual engine and alternator pair that you acquire. That selection will determine the control-box size limitations. (I temporarily assembled the major parts several times to determine the final arrangement.) These notes may ease your construction. A socket set, wrenches and nut drivers turn this process into a breeze. So tune in your favorite listening frequency and enjoy the pleasures of being an insatiable tinkerer.

As you build, take measures against hazards: Prevent access to moving parts; tighten and seal connections against vibration; allow engine and alternator heat to escape; provide ventilation for cables and contacts carrying high currents; plan for exposure to the weather. Use plenty of grommets, wire ties, heat-shrink tubing, hot glue and strain reliefs to render all the connections Murphy proof.

Soldered connections may melt at the current levels found in this project. I crimped—and then soldered—heavy-duty lugs onto all the cable ends. For high-current connections, I bolted the lugs to the various components and jacks. Almost any circuit that shorts in the control box will likely melt. Finally, keep in mind that your Pup will probably operate in wet environments, so paint and seal its controls and connections against rain (and fuel vapors!).

Mechanical Assembly: Be an Iron Worker in your own Home

In the following assembly notes, I call the side of my engine with the fuel tank and carburetor on it the "front." The spark plug therefore sticks out of the right side and the crankcase is on the left. The alternator is to the left of the engine, beside the crankcase. This places the alternator on the cooler side of the engine (away from the cylinder). The control box is mounted atop the alternator.

Most lawn-mower engines seem to have the same three reinforced mounting holes on their base. (See Figure 4.) Two of the three holes line up with the front, so the long rail goes there. The third hole is at the "rear" and the shorter rail bolts to it. The engine mounts—via two angle-iron brackets, bolts and spacers—to the narrow flange of each main rail; the wide flanges become the vertical sides of the Pup's base. (Refer to Figure 2.)

Before you attach the rails, assemble the two engine brackets to the two front mounting holes on the engine. Position them to point away from the engine, toward the front. These brackets create plenty of el-

bow room for the engine's new pulley and permit easy access to the oil drain plug. They can swivel slightly, to easily mate with existing holes on the front rail.

Temporarily install the small mounting brackets to the engine, and measure the spacer length (Figures 2 and 4) required to perfectly align the two pulleys. Attach the two main rails so that they extend toward the left as far as possible. It is advantageous that the back rail has only one engine mount because the rail can pivot to accommodate alternators of any diameter.

My alternator did not require spacers because its two mounting holes are flush with the pulley side of its casting. The alternator's cooling fan blades scraped the edge of the rails so I trimmed the blade corners slightly. The threaded mounting hole of the alternator sits on the back rail and mounts to a slot you will cut out of the back rail later. The plain hole on the alternator casting pivots on the front rail, where it's attached. Check all clearances, and ensure once more that the two pulleys are in *perfect* alignment. Verify that the rails and spacers support the pulleys above the ground.

Now measure the arc that the alternator must swing along the back rail to accept a standard-length belt. A slot about 2 inches long allows for a 1 1/2-inch variation for belt size, eg, to accept *either* 28 *or* 29-inch belts. (I finished the unit before buying a belt—keep Murphy at bay, I say.) You can plan for standard-length belts during construction using the following formula:

$$BL \approx 1.57(D+d)+\sqrt{(D+d)^2+4C^2} \qquad \text{(Eq 1)}$$

where

BL = Belt length (make all measurements in inches)

D = Diameter of large pulley

d = Diameter of small pulley

c = Distance between pulley centers

To use all available space, I installed the control box on simple rubber-damped mounts that I improvised. They poise the box about 1 1/2 inches above the alternator. This allows for air flow and protects the alternator from the rain. Once you have measured all the large internal components and cabling and have established the placement of the control box, pick a suitable cabinet and mark it for machining.

To finish, I picked a spot for a heavy-duty ground lug on the front rail. Thereafter, a few inches will remain open at the left end of the two rails. You can secure a small piece of wood to them, to grasp when lifting the Pup by its left side.

Time to bend, bang, drill, flatten (bang some more), file and sand everything into its final shape. Polish all mechanical grounding points including the engine mounts. Cut the slot out of the back rail with a jigsaw. File off all sharp edges. When the relentless din of power tools, files, twisted blades and flying metal bits finally subsides, you will emerge victorious—and ready for subassembly and painting. Spray paint the mounts, rails and the control box with high-temperature engine enamel.

JAMES ST. LAURENT

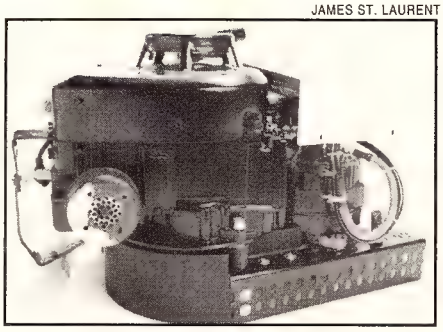


Figure 5—A rear view clearly shows the largest mechanical shield in place and the carry handle—made from L brackets—that protects the spark plug from damage.

JAMES ST. LAURENT

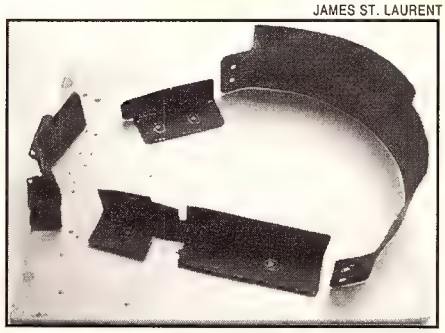


Figure 6—The protective shields, arranged on the plywood base to approximate their mounting positions.

The protection circuit is built on a piece of perf board. When the output voltage exceeds 15.5 V, a heavy-duty, 5 V PC-board relay grounds the engine's magneto neutralizing wire to stop the engine.

The correct value for R2 depends on the relay's characteristics, so it must be set for each particular relay. To do so, install 10 kΩ pots in place of R1 and R2. Set both pots for maximum resistance. Connect an 18 V variable-voltage power supply across the circuit. (Connect the positive lead to D2's cathode and the negative lead to Q1's emitter.) Set the supply to your desired trigger voltage, and switch on the power. Adjust the R1 pot until the LED just lights. Then adjust the R2 pot until the relay just closes. The two adjustments may interact. Make a final adjustment of R1 when the Pup is complete with the control box installed and the battery disconnected. Finally, remove the pots, measure their values and replace them with combinations of fixed resistors.

Once my basic unit was tested, I added a pair of modified L brackets with a wood handle to the engine's right side. Together they span over the spark plug to protect it from being broken. (Do *not* loosen the cylinder head bolts to mount this!)

The protective mechanical shields that work well on my particular version are four custom-shaped pieces (cut from 22-gauge sheet metal stock, 7×24 inches). Machine screws hold them to the rails. (See Figures 5 and 6.) Attach the entire unit to a solid base (I used plywood) that blocks any access to the underside of the Pup. Editor Robert Schetgen, KU7G, suggests a lightweight hand cart as a base. Again, keep *all* the moving parts *completely* shielded!

You will love the 12 Volt Pup! It charges big batteries in a couple of hours. A gallon of gas lasts about four hours with a constant 20 A output. It usually loafs at low speed once a large battery has taken its initial charge. The gang at the Concordia University, VE2CUA, Field Day site was very interested in the Pup, and they first suggested that I write this article. Many members already have their own models churning in their minds. Richard Allix, VE2ARW, promises a miniature pup, to be born from a weed whacker and a motorcycle alternator. You are certainly welcome to write me with your comments and experiences. Good Health, Good Luck and Great DX from VE2NYP!

Notes

[1]I did not locate a suitable automatic-reset circuit breaker. Manual-reset breakers in that current range (*eg*, Potter & Brumfield W31X2M1G-50) cost about $20, or more. A large fuse would be less expensive. Automobile manufacturers use a fusible link to protect the alternator output.—*Ed.*

[2]According to E. P. Rolek, K9SQG's "A Source for High-Current Relays," in Hints and Kinks (p 73) Wal Mart may be a good source for such parts.

Yaniko "Nick" Palis first became interested in radio communications in his early teens. After some 20 years of SWLing, he finally decided to get on the air by becoming VE2NYP in 1990. Nick ran his college's broadcast radio station and designed many high-power laser light shows in their heyday (up to the early 1980s). He was a lighting director for films and television specials and would sometimes design custom electronic special effects for movies. He was a unit and location manager for many years. Yaniko is presently a supervising producer for feature films and television series in international distribution. Amateur Radio has revived all those previous technical interests and put them to good use again! You can reach Nick by mail at PO Box 61 station Place du Parc, Montreal, PQ H2W 2M9, Canada. QST

Feedback

◊ In the May, 1997, *QST*, page 83, there is an announcement for a Gelber Electronics monitoring system. Unfortunately, the contact information is missing: Gelber Electronics, 801 S Halcyon Rd #6, Arroyo Grande, CA 93420, tel 805-489-4253 QST

By Kathy Falls, KB8ZZZ; Gerald Gomes Jr, WB8RNY; Mike Karmol, N8KUF; and Larry Lindner, KB8AIZ

The Crash of ComAir Flight 3272

The New Year 1997 was only nine days old when the news media told us that ComAir flight 3272 had crashed in Michigan, killing all 29 souls on board. Most of us followed the newscasts on television, seeing the images of destruction with the detachment made possible by televiewing.

Hams from Michigan's Wayne and Monroe Counties quickly went into action, providing communication for the various emergency response agencies and their support activities. The destination airport, Detroit Metropolitan Airport, is in Wayne County, and that county's RACES organization was mobilized at the request of the director of emergency management. The flight crashed in Monroe County, and that county's ARES was activated to provide additional communication support. The two counties' ham communication systems supported different parts of the massive effort, with liaison maintained between the two systems to pass traffic and to share information.

Four of those hams tell this story....

Ham Support of the Post-Crash Operation

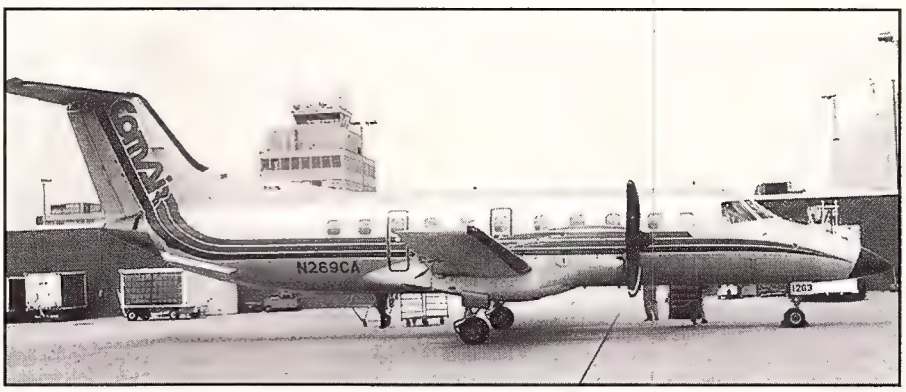
WB8RNY, Wayne County:

On Thursday, January 9, 1997 at 3:50 PM (all times are given in EST), ComAir Flight 3272, an Embraer EMB-120, crashed near Ida, Michigan.

Flight 3272 had originated in Cincinnati, Ohio, and was on its approach to Detroit Metro Airport's runway 3R when it experienced a rapid upset in roll and pitch. Seventeen second later, it smashed violently into the frozen ground, instantly killing all 29 people aboard.

The weather: Light snow and fog; wind, 5 knots out of the northeast; 3/4 mile visibility; broken cloud cover, with layers at 600 feet and 1200 feet, and overcast at 1700 feet; temperature, 27° F; freezing rain.

As the EC for Wayne County, Michigan, I received the alert call of the crash at 3:59 PM. I called Director of Emergency Management Mark Sparks, and he placed our RACES and ARES on standby alert. At 4:29 PM, the members of Wayne County's Emergency Management Division (emergency management division) staff were activated. I received the following page, "Call County emergency management division, passenger aircraft down in Monroe County, was en route to Metro AP. We are activating Family Center. *This is not a test.*"



DAVE PATTERSON, WB8ISZ

A ComAir Embraer EMB-120 *Brasilia*, similar to the ill-fated flight 3272.

I picked up my hand-held radio and headed out the door for a long night. My first call was to be sure that the rest of the Wayne County RACES and ARES staff received the page. Our local Detroit Edison UHF repeater on 442.8 MHz came to life, as we talked about assignments on the way to the Emergency Operations Center.

KB8ZZZ, Monroe County:

No one ever expects the tragedy of an airline crash in his own backyard, But, in Monroe County, on a very cold afternoon in the middle of winter, we heard the first reports of a plane going down, north of the county seat, in the middle of our predominately rural community. ComAir Flight 3272 went down at 3:50 PM, and at 4:10 PM the first ham arrived on the scene—Fred Van Daele, KA8EBI. Fred had jumped into a vehicle with his brother-in-law and they drove to the scene to see if they could assist in any way.

Driving to the site on Day 2, with near-zero visibility.

Monroe County Emergency Coordinator Mike Karmol, N8KUF, was notified of the crash at 4:15 PM by Gene Krolak, N8PDK, who had been monitoring from his home. Mike immediately activated a communication center at the Monroe County Chapter of the American Red Cross. The President of the Monroe County Radio Communications Association, Jeff Hutchinson, KB8ZRX, is also the Disaster Director of the local Red Cross Chapter, which helped make the operation flow smoothly.

Mike put a call out for volunteers to establish radio communication for the command center, the emergency operations center, the crash site, emergency response vehicles and the food preparation center that would be supplying food and hot drinks for the many people who would be on the scene.

Many hams volunteered immediately to cover the various locations and to help the Red Cross coordinate their drivers and all volunteers. That first night, we had more than enough ham volunteers, resulting in a large standby list. In addition to the police and rescue teams at the crash site, there was the inevitable and immediate influx of news media personnel.

At first, we all hoped there would be survivors, but it didn't take long for the news to reach us that no one lived through the crash. With a feeling of sadness, the command center was secured at midnight, with the volunteers told to return the following morning at 7:00 AM.

KB8AIZ, Monroe County:

January 9 was an unpleasant winter day in southeastern Michigan, but at 3:56 PM it became even more unpleasant. My wife Diana, KB8VIU, called me on the telephone to tell me that acommuter airplane with 26 passengers and 3 crew members bound for Detroit Metro Airport had crashed in Monroe County, about 18 miles from the airport.

One of the first persons at the crash site was Fred, KA8EBI. It was immediately obvious to him that no one would survive the crash. Police, fire and rescue personnel began arriving at the crash site within minutes. Fred stayed at the site for several hours and provided information to Mike, N8KUF, who had arrived at the Red Cross chapter house. Mike put out a call for Amateurs to report to the chapter house for assignments.

Amateur Radio was used for communication among the various locations—the Red Cross chapter house (the ARES control station), the emergency operations center (established in the Emergency Management Division office), the field command post (in the Raisinville Township Hall, less than 1/4 mile from the crash site), and the Monroe Missionary Baptist Church (where hot food and refreshments were being prepared for the workers). It was also necessary to provide radio operators for each Red Cross vehicle—the emergency response vehicles from the Toledo and Detroit ARC Chapters, the local chapter van and various other personal vehicles. We made duty assignments as ham volunteers arrived and as the various locations and vehicles became active.

Amateur radio became the sole source

News media vans, set up adjacent to the crash site.

"Call County emergency management division, passenger aircraft down in Monroe County, was en route to Metro AP. We are activating family center. *This is not a test.*"

Jim Wades, WB8SIW, at the communications center at the Monroe County Red Cross chapter headquarters.

of command and control radio communication to coordinate the volunteer care and feeding operation of the great number of emergency, law enforcement, investigative and media personnel. On the first night, 12 hams were involved, some working until 2:30 AM.

WB8RNY:

I arrived at the emergency operations center at 4:48 PM and reported to the Director of Emergency Management. We had to get our radio equipment up and running, and then get the supplies ready for the family center. Assignments were given out as our staff members reported in—Emergency Coordinator Gerry Gomes, WB8RNY; Deputy EC Bill Toth, N8GYK, NCS of the command net; and Assistant EC John Buck Jr, N8PJG, the packet radio station.

Those assigned to the family center included Assistant Emergency Coordinators Ron Peterka, WA8OOH; Shanon Herron, KA8SPW; Chris Kania N8FZT; John Roberts, N8WAQ; Allen Bachran, N8ZZJ; and Kevin Kirschke, N8ZGO. Assistant Emergency Coordinator Rob Numerick, WB8ZPN, and Gary Morgan, WA8TJA, were assigned to the mobile command post. The standby emergency net NCS was Assistant EC Randy, N8MAX, operating on the Detroit Edison VHF repeater (145.33 MHz) and acting as our liaison to Monroe County. ARES NCSs Bob, K3UWO, and Mark Burgess, N8NAV, were on 146.72 MHz. As things at the emergency operations center became busier, additional personnel were assigned to it, including Westland (Michigan) Emergency Coordinator Mark Schultz, N8TUO, and Assistant EC Don Hosmer, N8TAV.

Our mission was to provide all communication (fax, cellular and wired telephones, Amateur Radio voice and data, and Emergency Management Division main communication) to the emergency response positions. The emergency operations center radios were on seven ham frequencies—2-meter voice, 2-meter packet, 220-MHz voice, 220-MHz packet, 440-MHz voice, 3932 kHz (the state emergency frequency)—and the county's 800-MHz trunking system.

Randy, N8MAX/mobile, checked into the command net on 442.800 MHz. At that time, Bill, N8GYK, was running both the command net and the standby net. When Randy arrived home, Bill asked him to assume NCS of the standby net on 145.33 MHz. The standby emergency net was used to reach those not already involved in the net, to recruit other volunteers, to pass information to the standby group of Amateur Radio operators, and keep to lower priority traffic off the critical emergency nets. It was a net where hams could ask questions, pass and receive related information, but, most importantly, it was the place everyone was dispatched from.

Bob, K3UWO, and Mark, N8NAV, acted as liaisons from our net to the Monroe County Emergency Net on 146.72 MHz. They would gather information from the Monroe Emergency Net and pass it on to us. We received most of our information as to the progress of the event from Bob and Mark. We also had hams who checked into our net to make sure they were not headed for a roadblock or congestion, and local hams offering to help.

Mobile Command Post

The mobile command post was dispatched to the crash site by Director of Emergency Management Mark Sparks. When Rob, WB8ZPN, arrived at the emergency operations center, he was asked by emergency management division staffer Mike Horvath to man the mobile command post. The mobile command post, with Mike and Rob on board, was on its way in about 10 minutes, monitoring the command frequencies on VHF (the N8DJP repeater, 147.16 MHz) and UHF (the W8ICN repeater, 442.8 MHz. The MCP operators were able to hear the rest of the group being dispatched and en route to their assignments. The weather was snowy, with 17-mph winds, gusting to 35 mph.

Their first stop was at the Monroe County emergency operations center at about 5:40 PM. They reported to the Monroe County emergency management director and the county sheriff, who gave them a quick briefing. They asked if any RACES operators from the Monroe County group were at the emergency operations center and were informed none had been assigned. The Monroe County sheriff dispatched them to the crash site, with the assignment of helping with the staging down of emergency personnel at the scene, in order to get fire department, Michigan State Police, and county sheriffs back to regular duty just as soon as they could be released from the crash site.

Mike and Rob arrived about 6:10 PM at the crash site, reported to the incident commander, parked the mobile command post, and immediately started relaying information for the county sheriff. At the crash site, the temperature was about 10° F, with wind gusting to 37 mph. By 7:30 PM, the only emergency personnel still on site were one fire department vehicle, 10 Michigan State Police, and a few local police officers.

The mobile command post was parked about 100 yards from the crash site. Looking out the windshield, the operators could see parts of the plane and the impact hole. The good communication capability of the mobile command post was soon obvious, and not only our staff, but also FAA and ComAir officials were making use of its services. The 800-MHz trunking radios were not reliable for passing information to the county emergency operations center, because of the distance involved, but they worked well as an intercom around the crash site.

At 10:00 PM, the incident commander thanked the mobile command post operators for their assistance and released them from the site. They reported back to the Wayne County emergency operations center for debriefing, and finally left for home just before midnight.

Family Center Radio Team

Also during Day 1, the family center radio team was moving equipment and supplies from the emergency operations center to the family center, a reception center for families of the crash victims. Ron, WA8OOH, was assigned as the family center communications coordinator. He was assisted by Shanon, KA8SPW, at the telephone and radio message control position in the main communications post, who took

The mobile command post was parked about 100 yards from the crash site. Looking out the windshield, the operators could see parts of the plane and the impact hole.

all incoming traffic and dispatched all outgoing traffic. John, N8WAQ, was assigned to operate the fax machine and to assist at the various communication positions. Allen, N8ZZJ, was assigned as a personal "shadow" to emergency management division Assistant Director Sandy Atlschul.

At 5:45 PM, Shanon, KA8SPW, was the first to arrive at the family center, where he set up communications using his dual-band H-T with an ac power supply and a mag-mount antenna. He established contact on the command frequency with the emergency operations center. At 5:59 PM, Ron, WA8OOH; John, N8WAQ; and Allen, N8ZZJ, arrived at the family center with a van full of equipment and supplies. After the team unloaded the equipment and supplies, they set up their equipment, cellular telephones with power supplies, a fax machine, 800-MHz trunking radios, and the Amateur Radio packet station. A request for additional personnel was sent to the emergency operations center.

At 6:42 PM, Chris, N8FZT, arrived and was assigned to the packet radio station. At 8:00 PM, Kevin, N8ZGO, arrived, to help wherever needed. Throughout the evening, the family center hams passed fax, phone, radio, and packet traffic to and from the emergency operations center and the mobile command post at the crash site. Shanon kept a log of all voice and radio incoming and outgoing information, including the names and numbers of all the people calling in by telephone. The voice and radio logs were used as references by many of the emergency officials during the incident, and were used extensively during the termination briefing. The logs were photocopied and given to Emergency Management Director Mark Sparks. The importance of accurate voice and phone logs cannot be overemphasized.

Net Operation

The net's operation was flawless—there were no problems with noise and no repeater malfunctions. Our local ham community was very supportive, and the hams that participated were very patient.

We had about 40 check-ins, of which 18 hams were dispatched for duty. The standby RACES/ARES net ran from about 4:45 PM to 10:00 PM, using the call sign WC8AAA. At 10:00 PM, NCS Randy, N8MAX, closed the net to allow the regularly scheduled NTS traffic net to operate. Unfortunately, we were not able to release the repeater in time for the scheduled session of the Edison Information Net, and we thank them for allowing us to continue using their repeaters. The only unusual activity came when one of the emergency repeaters went down, and there was a need to pass information from the mobile command post to the emergency operations center. The flow of traffic was temporarily moved to the standby net, and then to a new repeater, as soon as it was located and cleared for our use.

KB8ZZZ:

One of the hams' tasks was to assist the Red Cross in feeding all the volunteer workers, the officials, the news media and the families of the victims. On Day 2 (the day after the crash), the weather became even worse, with 45-mph winds and wind chills of –35° F. The wind-driven cold would cut right through you, the driving visibility was almost zero, and, because the crash site was in an open field, there was not much shelter from the inclement weather.

We had radio operators on every emergency response vehicle. Some of the emergency response vehicles would take food, hot coffee and hot chocolate to the workers—who were *very* grateful. About 250 meals a day were prepared, delivered and served, making communication with the Monroe Missionary Baptist Church, where all the meals were prepared, essential. We also had to deliver much-needed hand-warmers and hats to the emergency personnel at the site.

KB8AIZ:

When Day 2 brought more of the cold weather, it was obvious that the workers would require even more hot food and refreshments. Workers at the crash site could only work 10 to 15 minutes before they would be forced to retreat into a nearby Quonset hut to warm up before resuming their work.

A temporary morgue was set up at nearby Custer Airport, making an additional site that required hot food and refreshments. There were 12 Amateur Radio operators involved, and the day ran from 7:00 AM to 7:30 PM.

Chairman Jim Wades, WB8SIW, of the State Communications Committee for the American Red Cross, arrived at the chapter house with a number of cellular telephones and alphanumeric pagers. The Red Cross field workers preferred Amateur Radio voice communication over the cellular telephones because they felt that being able to listen to *all* related amateur communication was a significant benefit to them in keeping aware of the big picture.

Telephone circuits—both cellular and landline—were near overload, in part because of the large number of media personnel present. While Jim's responsibility included the Red Cross communications function as a whole, he allowed the ARES operation to continue basically untouched because it was successfully covering the needs of the mass-care operation. All decisions regarding ARES operation were left to the emergency coordinator, who was most familiar with his people and their capabilities.

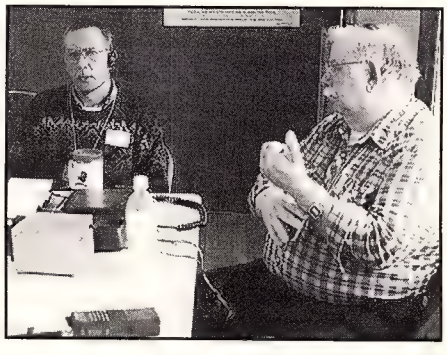
KB8AIZ:

On Day 3, 10 Amateur Radio operators were in service from 7:00 AM until 6:05 PM, performing the same support functions as they had the previous day. The weather was still cold, and the blowing snow caused whiteouts and made driving treacherous. At the end of Day 2, the Toledo emergency response vehicle was released by the Red Cross, because a routine had been established that could be handled with only one emergency response vehicle. The Detroit emergency response vehicle returned to its base for the night, and it would return the following morning with a fresh crew.

KB8ZZZ:

Ironically, the week before the tragic

Nick, AA8RU, loads food from the church to transport to the crash site.


Authors Mike, N8KUF, and Larry, KB8AIZ.

plane crash, our general-interest club had discussed the feasibility of implementing a disaster plan in case of an emergency. Little did we know what events were soon to unfold.

Day 4 of the operation was the most difficult from the emotional standpoint, when family members of the victims held a memorial service at the crash site. Since the site, command center, morgue, and Emergency Management Division Headquarters were restricted areas, the only people allowed to enter were officials, emergency rescue personnel, and relief service personnel (which included ham radio operators).

The families were taken to the crash site by buses, with the assistance of the Red Cross volunteers and communications operators. It was a very sad day, but the families were very grateful for the support of the community. A memorial plaque was placed at the site (see the lead photograph).

KB8AIZ:

Day 4 brought out 12 of our Amateur Radio operators and more cold, windy weather, and even *more* complex logistics. The families of the flight crew and victims were to be transported to the crash site for a memorial service. The steps necessary to assist the Red Cross prepare for the ceremony while continuing to perform its feeding functions—while being sensitive and respectful to the ceremonies taking place—made logistical moves difficult, to say the least. There was a time when the emergency response vehicle was two hours behind schedule serving meals, yet was expected at the crash site for the ceremony. Our efforts on this day went from 7:00 AM to 7:45 PM.

On Day 5, eight hams provided communication support from 7:00 AM to 5:30 PM. As the day wore on, communication became more routine and the daily number of entries in the log began to decline.

Then, on Day 6, five hams supported the activities from 7:00 AM until approximately 4:30 PM, when we officially concluded the ARES activity.

> The importance of accurate voice and phone logs cannot be overemphasized.

Lessons Learned

WB8RNY:

Randy, N8MAX, strongly believes that there is no way to provide emergency communication without *multiple* and simultaneous communication modes at your disposal. Randy was running a small multiplexing system at home, using the standby net, the command frequency, and a telephone. There were many occasions when Randy would be talking to someone on one frequency or the telephone and information would come in via another route. Randy was able to immediately pass that information on without unkeying his mike, carrying on two conversations at one time. Randy thinks that kind of capability make hams the superior communicators that they are. We develop that learned skill by listening to more than one mode of communication at the same time and performing mental multi-tasking.

The success of ARES and RACES volunteer programs depends on people with a commitment to serve others in times of disaster. The cooperative efforts between those hams and emergency response organizations are an indispensable and integral resource in emergency response.

Thanks to the amateur community of Wayne County, Michigan, for their support of our program and the trustees of all the repeaters we used during this operation. My special thanks go to those who helped me with this article—Ron Peterka, Robert Numerick, Randy Goebel, and Shanon Herron.

KB8ZZZ:

After the operation, ARES volunteers met the following Saturday for a critique, and to discuss the role that we had in this emergency. We determined that cellular telephones were not practical for the communication links that were needed. Fred, KA8EBI, reported that in the nearby town of Dundee it was taking 45 minutes to get a dial tone on cellular, because of the circuit demands caused by the emergency plus normal usage. Another feature of Amateur Radio was the speed of passing information—without having to wait for a dial tone, dial a number, wait for an answer, ask the question, hang up, wait for another dial tone, dial another number, wait for an answer, then pass the information to the new party. Also, and perhaps most important, netting, which can't be done with cellular phones, allowed information to be passed to numerous stations simultaneously.

We discussed procedures, protocol, equipment and possible training programs for the future. With our thinking stimulated by the actual emergency, and with the

Monroe County Emergency Coordinator Mike Karmol, N8KUF, Adds:

Memories of the tragic disaster will continue to affect the lives of the volunteers who were part of the recovery effort for a long time to come. But I'm very pleased with the overall performance of our ARES organization and its members in providing communication support to the Red Cross following the ComAir crash. We've worked closely with the Monroe County Chapter of the ARC for many years, starting with a major flood-relief effort in 1964. This close relationship, which had put us on a first-name basis with most of the Red Cross officials and key disaster team volunteers, allowed us to "hit the ground running" when the need for our services arose.

Our regular participation in support of parades, walkathons and similar events (at least four such activities per year) has been very beneficial. In many ways, support of the activities following the ComAir crash was similar to an extended (albeit much more serious) public service operation. Many of the ARES members who supported the disaster operation regularly turn out for the public service events, so they were well-trained for their duties. Those who had not previously taken part in public service events learned quickly from those who had.

Many ARES members were able to provide nonradio help by serving meals, carrying food and supplies, and so on, without that work intruding on their primary function as communicators. In one instance, hams were even able to repair the wiring for a heater in the back of an emergency response vehicle (a critical piece of equipment in this kind of weather). While many of the Red Cross volunteers and drivers were from other chapters and not familiar with the area, our local ARES members were able to also act as navigators (at least one of them was on board each vehicle). The key point is that all the people involved functioned as a team, and we watched for opportunities to assist with other duties without losing sight of our primary function.

Our challenge now is to look closely at the aspects of the operation that made it a success, define anything that could have made it better, examine those things that could have lead to nightmares had they gone wrong, and to incorporate these lessons learned into future operations.

After being released from duty on Day 6, I was relieved to be headed home to relax with my family, who hadn't seen much of me for almost a week. I was five minutes from home when I heard a call from Jeff, KB8ZRX, who was asking for a ham to go with the chapter van to serve hot beverages to firefighters at the scene of a house fire.

I paused only long enough to figure out how I would explain this to my wife, and was soon on my way to another satisfying assignment.

Red Cross field workers preferred Amateur Radio to cellular telephones; being able to listen to all related communication helped them to stay aware of the big picture.

knowledge of our strengths and our weaknesses, we easily saw where further organization, training, and equipment was needed.

About 30 of our operators were involved in the operation. We provided over 600 man-hours of communication support and assisted in the delivery of over 2000 meals.

This operation brought our members closer together. As Larry Lindner, KB8AIZ, eloquently stated, "Before this tragic event, all these hams were my friends—but, after working with them so closely the last few days, they now seem like my family."

In addition to those already mentioned in this article, special thanks go to other members who donated their time and expertise: Gloria Bacome, KC8FKC; Roger Bacome, KB8WVQ; Rita Baker, WB8FBG; Tom Cooper, N8OSC; Walt Gunstrom, KB8POA; Bernie Burger, K8LVT; Jim Kerr, N8GHP; Dave LaFountain, N8TAT; Fred Lux, WD8ITZ; George Henzler, WB8HHZ; Ray McDonald, WA8SFF; Nick Peth, AA8RU; Irv Reaume, KB8TML; Brenda Van Daele; KB8KQC; Dale Williams, WA8EFK; Marjie Willey, KB8TMM; and Ray Willey, WA8BQW.

KB8AIZ:

We met for a post-operation critique on January 18. Most items discussed were positive. Early in the operation, we placed a notepad for recording "brainstorming, comments or notes" on the communications table, and its use was strongly encouraged. The following thoughts come from that notepad.

1. Each vehicle should be equipped with a mag-mount antenna—an H-T with a rubber duck *is not reliable* from inside a van. We felt that temporary installation of mobile rigs should be done, whenever possible, if the operation is expected to extend beyond two or three days.

2. The communications position should be in a separate room, if possible, and headphones should be used, unless several people are listening to the radio. Noise was often a problem during our operation.

3. Off-duty ARES personnel should be kept in a staging area away from the communications desk, to reduce noise and distractions.

4. The use of tactical call signs would have been helpful, especially for the Red Cross personnel who were often listening.

Pooh and friends stand as an honor guard at a small memorial set up by local townspeople at the crash site.

How Do *You* Fit into This Picture?

As you read this story, keep in mind that *you* might someday be called on to provide public service communication in the aftermath of some local emergency or disaster. Ask yourself if you would be prepared. Contact your local radio club, ARES, or RACES group to volunteer your services, and to be included in training exercises. If you aren't sure who to contact, start by getting in touch with your section manager (see page 12 for contact information).

Don't think it's all fame and glory. It can be a dirty, bone-wearying and nerve-wracking job if the time ever comes. But it can also be fun and immensely rewarding, too. Sign up today!—*Rick Palm, K1CE, Field Services Manager.*

5. When more than one chapter becomes involved, we should have an established HF communications plan with the lead chapter, in case of telephone outage.

6. There should be a small whiteboard at the communications desk to record and display current assignments and locations.

7. We should consider placing someone in charge of ARES logistics and staffing and perhaps establish a net on an alternate frequency.

8. The local ARES Operations Manual should have a check-off list of things that should be implemented or considered. It is very easy to miss or forget things in the heat of battle.

9. Served agencies and our own operators may need a reminder that we are communicators *only!* We do not make decisions for the served agency.

10. Logs are important! When staffing is large enough, someone should be the dedicated logger (and extra set of ears). Our logs proved useful many times during the operation. We often had to refer to previous communications to determine the last known status of a person or vehicle. This also was useful in going back, after the event, to help Red Cross staffers as they were filling out their reports determine, for example, when the first emergency response vehicle arrived at the scene. It allowed us to review the sequence and content of the overall operation.

11. We didn't anticipate how long the event would last. The operation was staffed on a day-to-day basis. After Day 3, when activity appeared to slow down, we were told that we'd probably be "wrapping it up tomorrow." When Day 4 came, a new flurry of activity arose and we would be told that we'd probably be needed for "one more day."

In summary, the cooperation and radio discipline of all local amateurs was outstanding. The repeater was free of casual chatter, to the credit of those hams who were on frequency but following proper radio discipline. In addition to the 28 hams who participated, numerous others were monitoring at their homes and workplaces—ready to respond if needed.

Kathy Falls, KB8ZZZ, may be reached at 10779 Swan Creek Rd, Carleton, MI 48117; Wayne County Emergency Coordinator Gerald Gomes Jr, WB8RNY, at 35741 Ronald, Romulus, MI 48174;Monroe County Emergency Coordinator Mike Karmol, N8KUF, at 567 Vienna West Rd, Temperance, MI 48182; and Monroe County Assistant Emergency Coordinator Larry Lindner, KB8AIZ, at 2001 Ida Maybee Rd, Monroe, MI 48162. The photographs accompanying this article were made by Kathy, KB8ZZZ.

NEW HAM COMPANION

The Doctor is IN

Q Is it legal to send WAV audio files containing music over the air?

A A WAV file contains data that is *translated* into sound (music, in your case) by a personal computer running the appropriate software. It is *not* the music itself. If I listened to your WAV file transmission on the air, I would hear a buzzing or hissing noise, depending on the data rate. I certainly would not hear music. This is the distinction that most concerns the FCC.

Q Donald Powell asks, "I'm new to ham radio and I was wondering if it's okay to use Amateur Radio to discuss (or assist) other hobbies?"

A Ham radio is a hobby with endless horizons. We have the ability to discuss anything and everything—including other hobbies! You'll find nets on the HF bands devoted to chess playing, experimental aircraft, antique automobiles and much more. On the VHF bands you'll find FM communication used as a tool to facilitate car rallies, train "chasing" and even bird watching!

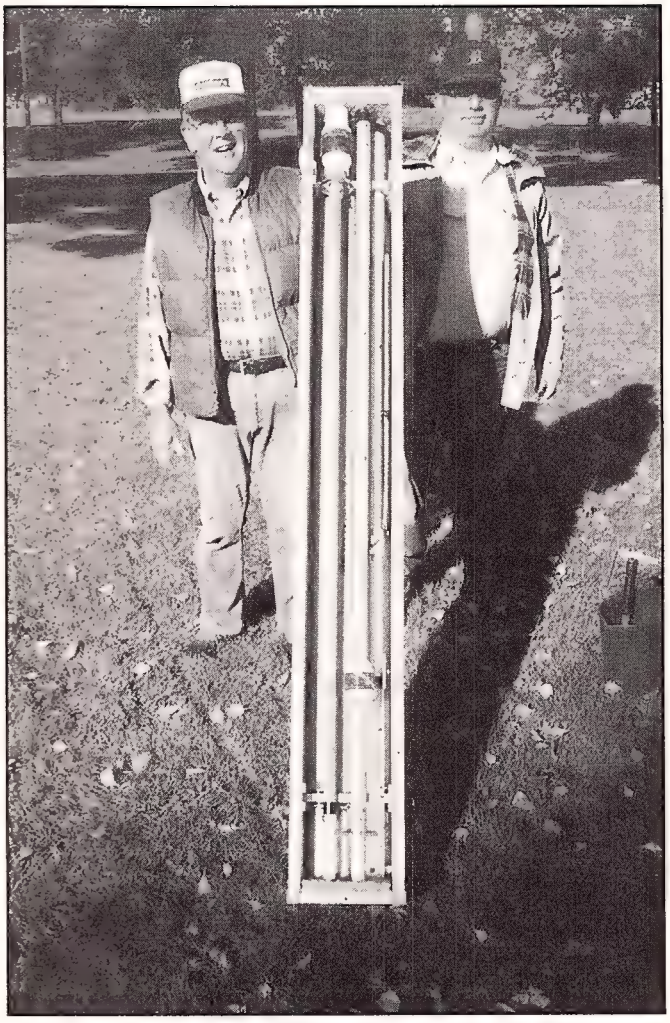
Q I own a 386 PC, which now seems like an "ancient" relic. I was considering an upgrade to a Pentium machine for my shack, but now I see that I must jump to MMX processor technology. I'm getting weary of all this instant obsolescence! What is MMX, anyway?

A MMX is simply a new breed of Pentium processor with enhanced capability for multimedia and 3-D applications (at least those are the applications that stand to benefit the most). MMX itself is an extension of the x86 instruction set that permits multiple bytes of data to be stored in the same register and operated on simultaneously. The upshot is that an MMX-enhanced microprocessor can do more work faster than a standard Pentium chip.

For all other applications, such as ham software, the improvement is not all that spectacular. If you compare a 200-MHz MMX system to a "standard" 200-MHz Pentium computer, both running *Nova* (a graphics-intensive satellite-tracking program), you would notice about a 20% performance boost with the MMX machine.

Q Raimo Karajalainen, KB2HN, asks, "What is a Battle Creek Special antenna?"

A The Battle Creek Special is a transportable vertical antenna for low-band DXing. It is a favorite of DXpeditions because it offers excellent performance on 40, 80 and 160 meters, yet it can be broken down into sections and packed into a single 66-lb shipping crate.



W8UVZ (l) and K8GG (r) with a wooden crate containing the Battle Creek Special, a three-band (160, 80 and 40-meter) vertical antenna. The crate is designed to ensure safe transportation to remote parts of the world.

The Battle Creek Special is a descendant of another design known as the Minooka Special. Charles Dewey, WØCD, of Battle Creek, Michigan, modified the Minooka Special by replacing its loading coil with top-loading wires—one for 80 meters and another for 160 meters. The modified design also incorporates coaxial cable traps for 80 and 40 meters. Although the Battle Creek Special looks somewhat like a vertical antenna, it functions electrically as an inverted L on 80 and 160 meters. Only on 40 meters does it "act" like a full-size, quarter-wavelength vertical. The antenna is supported by guy wires and employs an extensive network of radials.

Q John Meyer, KBØOLD, asks, "Do I have to have my computer connected to my packet TNC all the time for its mailbox to work properly?"

A You've asked an excellent question. The answer is that your TNC will work just fine—including the mailbox—without the computer "talking" to it. One word of warning, though: Unless your TNC mailbox has a battery backup, don't turn it off until you've fired up your PC and grabbed any waiting mail. Removing the power will erase your messages.

Q I often see power transformers for sale at hamfest flea markets. Most of the time, however, I have no idea which leads belong to which windings. Is there a way to find out?

Table 1—Power-Transformer Color Codes

Function	*Color*
Nontapped primary leads	Black
Tapped primary leads	Black
Primary center tap	Black/yellow striped
High-voltage plate winding	Red
High-voltage center tap	Red/yellow striped
Rectifier filament winding	Yellow
Rectifier filament center tap	Yellow/blue striped
Filament winding 1	Green
Filament winding 1 center tap	Green/yellow striped
Filament winding 2	Brown
Filament winding 2 center tap	Brown/yellow striped
Filament winding 3:	Slate
Filament winding 3 center tap	Slate/yellow striped

A Flea markets are great places to find cheap transformers. Despite the fact the transformer you've spotted is lying at the bottom of a dingy cardboard box, there is a good possibility that it's still useable. The problem is to determine what voltages and currents the transformer can supply. First consider the possibility that you're really looking at an audio transformer or other impedance-matching device rather than a power transformer. If you aren't sure, don't connect it to ac power!

If the transformer has color-coded leads, you're in luck. There is a standard for transformer lead color-coding (see Table 1). Where two colors are listed, the first one is the main color of the insulation; the second is the color of the stripe.

Check the transformer windings with an ohmmeter to determine that there are no shorted (or open) windings. The primary winding usually has a resistance higher than a filament winding and lower than a high-voltage winding.

If your mystery transformer isn't blessed with color-coded leads, I suggest that you check out Chapter 11 in the 1997 *ARRL Handbook*. Figure 11.2 shows a neat little test setup.

Q Can you tell me where I can find a frequency list for all of the currently active ham satellites?

A We publish the list about once each year in *QST* (see Table 2). In addition, you'll find lists in amateur satellite publications such as the *AMSAT Journal*. If you have Internet e-mail, you can always request the latest list from our automated Technical Information Service *InfoServer*. Simply address an e-mail message to: **info@arrl.org**. In the "subject" line type: **info request**. In the body of your message, enter:

SEND SATFREQS.TXT
QUIT

Q I notice that many dual-band FM rigs have crossband repeater functions. What are the legal issues surrounding their use?

A Although hams often refer to them as "crossband repeaters," a dual-band rig is really functioning more like a "remote base" when this feature is used. Let's say that you work in a metal building that blocks access to your favorite 2-meter repeater. You could park your car near your office and leave the dual-band rig operating in the crossband mode. With a small UHF H-T, you could use your mobile rig to relay your transmissions to the 2-meter repeater.

This scenario is legal if:

• You link to your crossband rig on the UHF side.

(You're meeting this requirement because you're communicating with the crossband rig on a UHF H-T.)

• Your unattended mobile rig is capable of identifying itself on its UHF output.

Table 2—Amateur Satellites: Frequencies and Modes

Satellite	*Uplink (MHz)*	*Downlink (MHz)*
SSB/CW		
AMSAT-OSCAR 10	435.027–435.179	145.825–145.977
Fuji-OSCAR 20	145.900–146.000	435.800–435.900
Fuji-OSCAR 29	145.900–146.000	435.800–435.900
RS-10	145.860–145.900	29.360–29.400
RS-12	21.210–21.250	29.410–29.450
		145.91–145.95
RS-15	145.858–145.898	29.354–29.394
RS-16	145.915–145.948	29.415–29.448
Packet—1200 bit/s (FM FSK uplink, PSK downlink except as noted)		
AMSAT-OSCAR 16	145.90, .92, .94, .96	437.05/437.026
DOVE-OSCAR 17	None	145.825
Telemetry only. FM FSK downlink.		
WEBERSAT-OSCAR 18	None	437.10
Telemetry and images only.		
LUSAT-OSCAR 19	145.84, .86, .88, .90	437.126/437.15
ITAMSAT-OSCAR 26	145.875, .900, .925, .950	435.870
Fuji-OSCAR 29	145.85, .89, .91	435.910
Mir space station	145.200	145.800
Packet mailbox. FM FSK.		
Packet—9600 bits/s (FM FSK uplink and downlink.)		
UoSAT-OSCAR 22	145.900, .975	435.120
KITSAT-OSCAR 23	145.85, .90	435.175
KITSAT-OSCAR 25	145.87, .98	436.50
Fuji-OSCAR 29	145.87	435.910
FM Voice		
AMRAD-OSCAR 27	145.850	436.800
Repeater. Daylight passes only.		
Mir space station	145.200	145.800
Occasional contacts with the cosmonauts. They are awake from 0500 to 1900 UTC and are most active on Sundays.		
Mir space station—repeater (CTCSS 141.3 Hz)	437.750	437.950

Since this is a remote base, your own ID over the UHF link serves to ID the 2-meter side as well. There is no way for you to identify the UHF output of your mobile rig, however. This is where the situation gets sticky. Your mobile radio needs some form of automatic identifier for its UHF output. Unfortunately, few radios include this function.

Q Despite the progress we've made in HF digital communication, I still hear hams using mostly old-fashioned Baudot RTTY during contests and DXpeditions. Why?

A I can summarize the answer in one word: *Efficiency*. In contests and DX pileups, the object is to exchange the necessary information as rapidly as possible, then immediately go on to work the next station. RTTY is well suited to this task. You can make a rapid RTTY exchange by simply keying your transmitter, tapping a few characters on your keyboard, then switching back to receive. All of the modern HF digital modes, however, employ some form of handshaking protocol to exchange data. You must establish a link, pass the data (including automatic repeat transmissions, if data is lost), then terminate the link. In the time it takes to make *one* PACTOR, CLOVER, G-TOR or AMTOR contest contact, you can make several with RTTY. Of course, RTTY lacks the error detection and correction features of the TOR modes, but as long as you can copy the critical contact data, RTTY is perfectly adequate for the job. QST

By Edward J. Farmer, AA6ZM

Let's Talk Transmission Lines

Don't neglect one of the most important parts of your station!

No one wants to discuss transmission lines. Many hams would rather chew aluminum foil. After all, transmission lines are just the cables that link your radios to your antennas. You hook them up and get on the air. Who cares? Boring!

Well, the subject may not have much "sex appeal," but if you want to get maximum performance from your station, give me your attention for a couple of minutes. These lines have a major influence on the results you'll achieve on the air. A little extra knowledge will—literally—take you a long way!

It's a Question of Impedance

Modern solid state radios expect a *load impedance* of 50 Ω, resistive. We want to connect them to an antenna, the feed-point impedance of which can be *anything*. It depends on the antenna design, plus how and where it's installed. In general, the impedance is "complex," meaning it has both resistive and *reactive* components. (Don't worry—we'll discuss reactance in a moment.)

Antenna Impedance

Even though the electrical properties are "distributed" throughout the antenna, it's easier to think about a *lumped impedance* representing the load present at its feed point. Two resistors in series with an inductor and capacitor is a useful model (see Figure 1).

One of the resistors is the desirable *radiation resistance*, which represents the useful work done by the antenna in converting your transmitter's output into radiation that spans states or continents! The other is the *loss resistance* resulting from the resistance of the wire and connections. (Now you know why you need good solder joints and sound mechanical connections on your antenna.) Power consumed in the loss resistance does not increase the RF field—it merely makes heat. The radiation resistance is usually the larger of the two, but in some designs, such as small loops, radiation resistance is so small that loss resistance becomes significant.

Reactance is the effect produced by the inductor and capacitor. The net effect can be capacitive or inductive depending on the frequency. An antenna is, after all, a distributed tuned circuit. At resonance, the capacitive reactance is canceled exactly by the inductive reactance and the net effect is simply that of the two resistors. When the operating frequency is below resonance, the capacitive component dominates while above resonance the inductive component dominates. Put another way, wire antennas that are shorter than required for resonance are "capacitive" and antennas that are longer are "inductive."

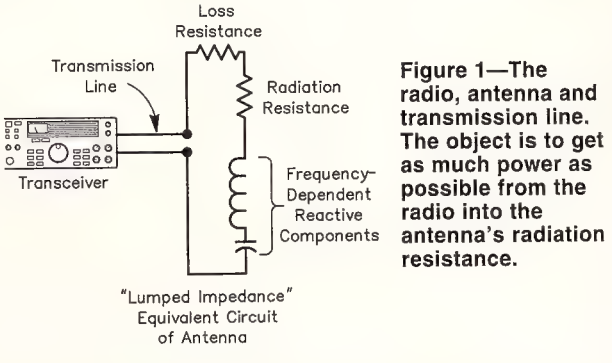


Figure 1—The radio, antenna and transmission line. The object is to get as much power as possible from the radio into the antenna's radiation resistance.

Transmission-Line Impedance

Now that you have a grasp of the nature of antenna impedance, let's consider the pathway from the antenna to your radio: the transmission line. Transmission lines (sometimes called *feed lines*) can take many forms (see Figure 2).

When most hams think of transmission lines, the word "coax" comes to mind. Coax—*coaxial cable*—has an inner conductor surrounded by a concentric shield. Its characteristics are derived from the outer diameter of the center conductor, the inner diameter of the shield and the electrical properties of the medium separating them.

Ladder line (sometimes called *twinlead* or *open-wire* line, depending on the construction) consists of two parallel conductors separated by an insulator, either plastic or simply the air itself. Ladder line also has a characteristic impedance and it is determined by the diameter of the wires, the separation distance, and the insulating material. Twinlead is often used for home TV antennas and has a characteristic impedance of 300 Ω. So-called "window" ladder line is commonly used for amateur work and has a characteristic impedance of 450 Ω. Other types are also available.

The property of most interest to us is the *characteristic impedance,* which is the impedance an infinitely long line would present to the transmitter. Since your transmission line is unlikely to be infinitely long, let's see what happens if you take a 50-Ω cable, such as RG-8, and terminate it with a 50-Ω resistor. The RF impedance measured at its source end will be 50 Ω, regardless of the length of the line. (Well, this is only true of lossless lines, but let's not lose sight of the principles involved!)

Most coax used in amateur service has a characteristic impedance of nominally 50 or 75 Ω. Figure 3 shows how impedance varies along a near-matched 50-Ω line. Figure 4 repeats the demonstration with the line terminated at 75 Ω. When the load impedance is *greater* than the characteristic impedance, a maximum impedance point occurs every half wavelength from the antenna, and a minimum impedance point occurs at every quarter wavelength point between. When the load impedance is *less* than the characteristic impedance, the maximum and minimum points swap places. Sometimes a difficult-to-match situation can be helped by changing the line length. Doing so changes the impedance seen by the transceiver or antenna tuner (and hopefully gets it within a range the tuner can handle)—*but it does not change the SWR on the line.*

And what about the effects of lossy lines? As Shakespeare wrote, "...ay, there's the rub." All transmission lines have some amount of loss, it's just a question of how much at what frequencies. The result is always the same: *Some of your power isn't radiated.* Stir in a high SWR and even *less* of your power is heading for the heavens. Let's find out why.

Matching Radios, Transmission Lines, and Antennas

If your transmitter needs to see 50Ω at its output, and you use a coaxial cable with a characteristic impedance of 50 Ω connected to an antenna with a feed-point impedance of 50 Ω, you're on easy street. The entire system is "matched" and maximum power is transferred from the transmitter into the antenna.

The problem is that antennas don't always have the common decency to present an impedance of 50 Ω. In fact, the feed-point impedance of a simple half-wave dipole depends on the height above ground, ground conductivity, and, especially, the operating frequency.

When the flow of power from the transmitter encounters an unmatched impedance at the antenna, some of it is reflected back up the transmission line. Try an experiment tonight to understand this concept. Turn on a flashlight in a dark room and aim the beam at the nearest window. The light travels across the room unnoticed and then encounters the window glass. Some of the light passes through, but some of it reflects back toward the flashlight. RF power in a transmission line acts in a similar way when it reaches your antenna.

As the reflected power heads back up the line, it interacts with the forward power to make *standing waves*. It is the ratio of forward to reverse power that you measure with your SWR (standing wave ratio) meter. The standing waves result from the mismatch of impedance between the line and the antenna. The SWR is the same (except for attenuation) everywhere along the line.

A high SWR promotes transmission line loss because the power initially reflected at the load has to make two more trips along the line—back to the antenna tuner or radio, and then back to the load. Thanks to the inherent losses in your transmission line, you're losing power during each one of these trips. The total loss depends on the length of the line through which the current flows. The higher the SWR and the longer the line, the greater the loss.

In addition, the transmitter-end impedance of the line is no longer the 50 Ω the radio needs. The impedance presented by the transmission line now depends on the impedance of the antenna relative to the line's characteristic impedance *and* the length of the line. If this impedance strays too far from 50 Ω, your transceiver will begin reducing its output—or it may shut down altogether!

One solution to the transceiver shut-down dilemma is to insert a device between the rig and the antenna system (or directly at the antenna itself) that effectively transforms the impedance to 50 Ω. Such a device is known as an *antenna tuner*. It's a collection of inductors and capacitors arranged to form an RF impedance transformer. When properly adjusted (tuned), the input impedance matches the transmitter (or transmission line, if it's placed at the antenna) and the output impedance matches the load.

When placed at the antenna, an antenna tuner provides a 50-Ω impedance at the end of the 50-Ω line that is fed from a 50-Ω transceiver, resulting in a 1:1 SWR on the transmission line and at the radio. Life on an antenna pole is hard for most tuners, so we typically put them near (or build them into) our transceivers. In that case, they match the 50-Ω output of the transceiver to whatever impedance is at the transceiver end of the transmission line. *They do not change the SWR on the line, or the loss it produces.* What can we do to reduce the loss?

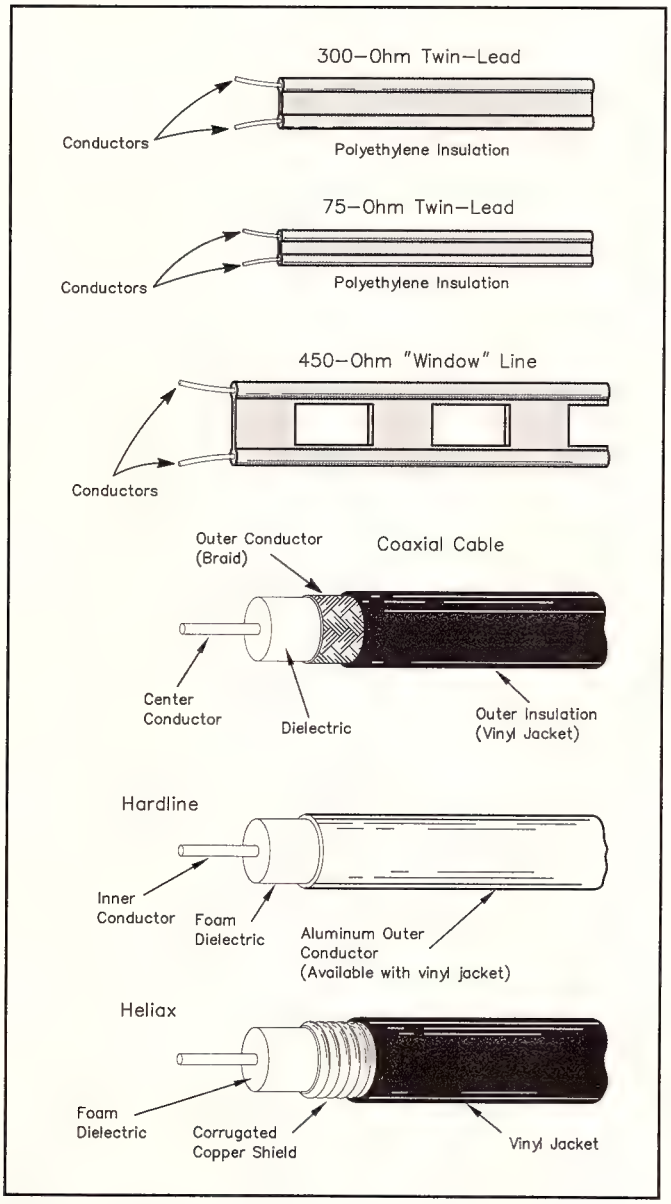


Figure 2—These are the most common types of transmission lines you'll encounter in ham applications.

Reducing Transmission Line Losses

Transmission line losses hurt two ways: They waste our transmitter's power and they attenuate the signals we receive. A line loss of 4 dB reduces the output of a 50 W transmitter to 20 W

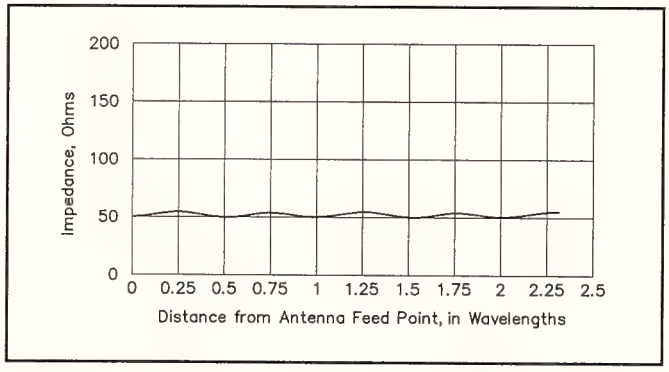


Figure 3—This graph shows the variation in impedance along a 50-Ω transmission line as you get farther from the antenna. In this case, the SWR is nearly 1:1 because the antenna is presenting an impedance that is very close to 50 Ω. Notice that the variations are minimal.

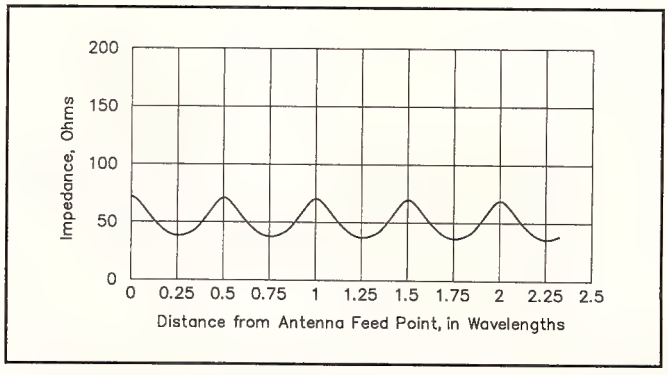


Figure 4—If we attach a 50-Ω transmission line to an antenna with an impedance of 75 Ω, there are substantial impedance variations along the length of the line!

Unbalanced Transmission Line Currents and Feed-Line Radiation

Center-fed dipoles are *balanced*, which means that they are electrically symmetrical. Ladder line is balanced. If you feed a dipole with ladder line, you have a nicely balanced system. So far, so good.

A coaxial feed line upsets the antenna's balance because the shield ultimately forces a ground at the transmitter. Inside the coax the current in the center conductor is matched by an equal but opposite current on the inside of the shield, resulting in a zero net field. Remember, radiation is produced by RF current flowing through a conductor. If the current in the center conductor and the current on the inside of the shield of the coaxial cable are equal but opposite, then the radiation field from one is canceled by the other resulting in no net radiation. (A similar analysis applies to ladder line.)

But this says nothing about the current that might flow on the *outside* of the coaxial shield. Remember the skin effect? Think about the outside of the shield as a third wire running from the connection point of the shield and antenna back to the connector on the transmitter, and hence to ground. Nothing prevents RF current from flowing on the outside of the shield, thus causing the shield to radiate. How much current flows on the outside of the shield? It depends on the length of the transmission line. A line that is an *integral multiple* of a half wavelength presents a low input impedance and permits current to flow. It's easy to say, "Avoid transmission lines that are integral multiples of a half wavelength," but in practice that's hard to do. The solution is yet another device. This one is known as a *balun*.

The term "balun" is short for "*bal*anced to *un*balanced transformer." Baluns provide a fixed ratio of impedance transformation and limit the flow of the unbalanced current (the one flowing on the outside of the shield).

Table 1—How much power are you *really* radiating?

Assume that you have a 100-W transceiver connected to one of the transmission lines listed below. How much power (in watts) actually makes it to your antenna? Examples are shown for 80, 10 and 2 meters, with 100 feet of transmission line and SWRs of 1:1 and 6:1 oneach of these bands.

Transmission Line Type	*3.5 MHz 1:1 SWR*	*3.5 MHz 6:1 SWR*	*28 MHz 1:1 SWR*	*28 MHz 6:1 SWR*	*146 MHz 1:1 SWR*	*146 MHz 6:1 SWR*
RG-58A	85	65	56	33	22	11
RG-8A	91	79	76	52	48	27
3/4-inch Hardline	98	93	93	81	83	63
450-Ω Ladder line	99	98	98	91	91	79

at the antenna. The signals we're trying to hear are also reduced by this same factor of 2.5!

As we've already seen, losses in transmission lines are directly related to their length. Loss data are usually reported in decibels per 100 feet, so one way to reduce line loss is to use less of it. Assuming the line is the shortest possible length, there are two ways to further reduce loss: Reduce the SWR, change to a lower-loss line, or both.

You can reduce the SWR by adjusting the antenna. In the case of a wire dipole, this means either cutting wire or adding wire.

Transmission line loss depends on the type of line and the operating frequency. Table 1 makes an interesting comparison of transmission line loss under both "matched" and high SWR conditions.

It's worth noting that ladder line exhibits substantially less loss on the HF bands than just about any other transmission line available. This means you can get away with SWRs on ladder line that would cause intolerable loss with coax. (This pertains to clean, dry twinlead. When the line is wet—and especially when it's wet and dirty—loss becomes much larger. The less polyethylene and the more air between the wires, the better.)

Let's Summarize...

The object of an antenna is to get RF into and out of the air. Your transmission line plays a critical role in getting this job done. When you shortchange yourself on transmission line, you shortchange your whole station.

As long as an antenna tuner is used, ladder line offers some compelling advantages compared with coaxial cable in almost any medium- or high-frequency application. This is particularly true when you want multiband operation with a single antenna.

When you're working above 50 MHz, remember to use the lowest-loss cable you can afford. The higher you go in frequency, the worse the losses become—even when the SWR is 1:1!

839 Shoreside Dr
Sacramento, CA 95831
e-mail 76121.3726@compuserve.com

New Products

TAPR-97 CD-ROM

◊ Tucson Amateur Packet Radio (TAPR) has issued its new *TAPR-97* CD-ROM that includes the TAPR software library, *APRS* software (for DOS, Mac and *Windows* PCs) and maps (for DOS and Mac PCs), Special Interest Groups files and mail archives, *RealAudio* files, *Quicktime* movies, and digital signal processing.

The *TAPR-97* CD-ROM sells for $20 (plus $4 for shipping and handling). It's available from TAPR, 8987-309 E Tanque Verde Rd No. 337, Tucson, AZ 85749-9399; tel 817-383-0000; fax 817-566-2544; e-mail **tapr@tapr.org**; WWW **http://www.tapr.org**. TAPR is a non-profit research and development corporation. Proceeds from CD-ROM sales help support TAPR programs. Membership in TAPR is $20 in the US and its possessions, Canada and Mexico, and $25 outside North America.

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◊ Balancing a flashlight *and* a bunch of tools can make nighttime and emergency station repairs a real juggling act. Brighteyes, binocular worklights that you wear like eyeglasses, add a new measure of safety and convenience. These "personal headlights" are made from durable, flexible plastic and are powered by four AAA cells (included!). Wear them with or without standard eyeglasses.

Price: $4.95 plus s/h. For more information, contact Thomas Kozee, KF4GTY, at EBCO Manufacturing, 100 W Pineloch Ave, Orlando, FL 32806; tel 407-858-9256, fax 407-858-9257.

By Richard Parry, W9IF

Position Reporting with APRS

Put yourself on the map—literally!

A few years ago, someone handed me a small Global Positioning System (GPS) receiver and said that this little device would tell me where I was located anywhere on Earth. I could not believe my eyes or ears, and was not prepared to be sucked into this canard. How could this device, barely the size of a cellular phone, tell me where I was located within a hundred feet? It just couldn't be; this had to be a hoax. Upon further discussion and a demonstration, I was hooked. I knew I had to have one, but wasn't sure why. It took a while to come up with an excuse, but I finally did, thanks to the pioneering work of Bob Bruninga, WB4APR, and his *Automatic Packet Reporting System* (*APRS*).

Before my final purchase, I spent two years playing armchair APRS quarterback. I stared at maps on my computer screen, watching the symbols that represented the locations of my fellow hams. Some of these symbols even *moved* while I watched! They represented hams who had GPS receivers in their automobiles, boats or whatever. The GPS receivers sent position information to packet radio TNCs (terminal node controllers), which then process the data for transmission to the APRS network.

With nothing more than a simple packet setup and *APRS* software, I could see my fellow Amateur Radio operators going to and from work, and see their weekend trips to the local ham store. Watching members converge on the Palomar Amateur Radio Club (PARC) meeting once a month was particularly interesting. Watching real-time special events—balloon expeditions, parades, satellites, boat races, and marathons—was fascinating.

APRS has many serious applications besides entertainment. In this article I'll concentrate on what I learned while installing my own APRS station. Although APRS is conceptually easy to grasp, the network protocol can be a little enigmatic, even for the advanced user. Setting TNC parameters can also be a little tricky.

There are several ways that you can start with APRS, ranging from literally no Amateur Radio equipment whatsoever (see the sidebar, "APRS on the Web") to a mobile system replete with TNC, GPS receiver, and transceiver.

Getting Started

If you have a packet station (TNC, transceiver, and computer or terminal), you have all the hardware you need to start monitoring APRS activity in your area. All that remains is to obtain an appropriate version of the *APRS* software. There are currently three versions, for Apple Macintosh, DOS, and *Windows*. By the time you read this, there might even be an *X Windows* version to run on Sun and Linux workstations.

Any of the Web pages listed in this article will direct you to the latest version of the software. The software is offered as *shareware*, which means you may freely download the software and try it. The Macintosh and *Windows* programs are full working versions, only the ability to save settings has been removed. If you decide to continue to use it, you should send the authors the requested registration fee. This entitles you to future updates and support. The software comes with installation instructions, but if you need help, there is the **aprssig@tapr.org** mailing list, where you will typically get an answer within hours, if not from the authors, by thousands of "Elmers" ready, willing, and able to help you.

Where to listen is the next piece of information you need. There are presently two main frequencies dedicated to APRS work: 10.151 MHz LSB on HF (the mark/space frequencies fall within the 30-meter ham band) and 145.79 MHz (in most areas) on VHF. For northern California, it is 145.01 MHz and in Canada it's144.39 MHz. Monitoring the HF band will show activity across the US, because of the propagation characteristics of 30 meters. The VHF band provides a picture of activity predominately on your home turf. However, as we shall see, there are exceptions to this rule!

Although I've indicated that there are only a few APRS frequencies, the situation is rather "fluid" and varies around the country. If you have Internet access, you'll find Web pages for the major metropolitan areas that provide excellent frequency coordination tools. There is APRS activity on HF bands from 40 to 10 meters, and also on 6 meters.

With standard packet station equipment and software, tune to one of the frequencies indicated and watch the activity. It won't be too long before you'll want to put yourself on the map, so to speak! So let's see what it takes to transmit APRS packets.

Configuring Your TNC and Software

The APRS protocol relies on Unnumbered Information (UI) packet frames to transmit location information. If you have previously used packet radio, you have used UI frames when you called CQ or activated your beacon function. For APRS work, all that is required is changing your *beacon text*, *beacon rate*, and *path*. On

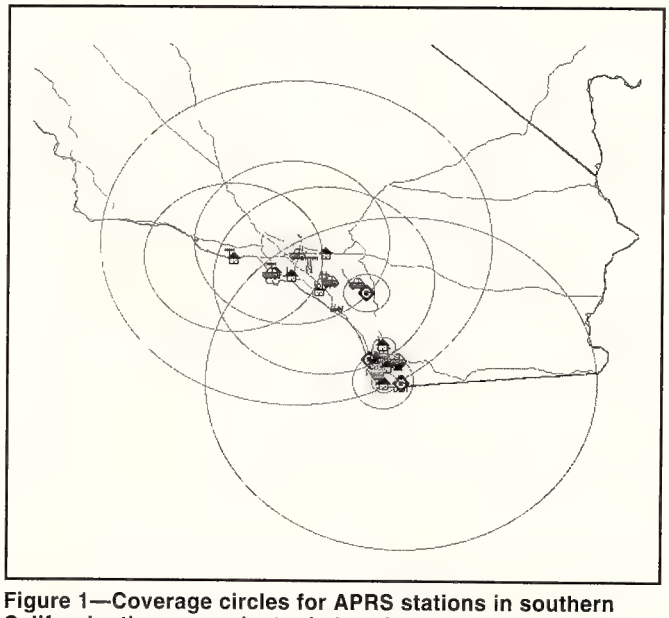


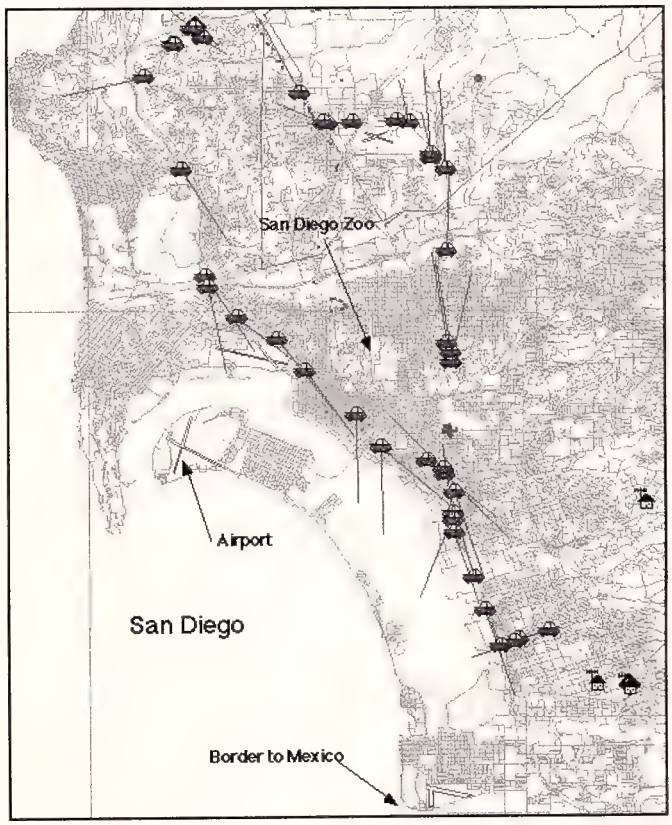
Figure 1—Coverage circles for APRS stations in southern California; the upper cluster is Los Angeles and the lower cluster, San Diego. The circles are based on PHG (Power, Height, and Gain) information broadcast by the stations. Although it makes an interesting display, it provides valuable information for the user to select an efficient digipeating path.

most TNCs these parameters are BTEXT, BEACON, and UNPROTO, respectively. In practice, there may be a few other parameters needing initialization, but these three are particularly important.

APRS is becoming so popular, virtually all TNC manufacturers advertise APRS-compatible TNCs that provide additional functionality specifically designed for APRS work. These features include the ability to easily interface with an external GPS unit. These TNCs also have parameters and buffers dedicated to APRS use. In those cases, the standard parameters (BTEXT, BEACON, UNPROTO) remain the same and you specify APRS specific parameters.

For example, one manufacturer of an APRS-friendly TNC has a Location Text (LTEXT) parameter where you specify your position and therefore leave BTEXT unchanged. This assumes that the TNC is being used in a stand-alone configuration (no computer control). When a computer with *APRS* software is used to control the TNC, you specify the parameters with simple "fill in the blank" boxes and the computer system controls initialization. However, for simplicity and clarity, let's assume that you have a standard TNC and that it will be transmitting position reports independent of a computer.

Setting the beacon rate requires a little understanding of the APRS network. Technically, there is no reason you can't transmit a location as often as you like. In practice, however, fixed stations (eg, home stations), should not transmit more frequently than every 30 minutes. There is a good reason for this: APRS is an *unconnected broadcast protocol*. This means there is no acknowledgment between stations when a packet has been received. Therefore, if packets collide, there is no retransmission and the information is lost. This is significantly different than the normal AX.25 *connected protocol* that assures error-free transmission. So, to reduce collisions, the rate between transmissions should be extended to assure a high probability that the channel is available.



Here is a street map of San Diego showing the daily commute of the local APRS group. The area displayed is approximately 18×15 miles. The vector lines show vehicle direction. Call signs of stations are not shown for clarity—and to protect the innocent.

Since a fixed APRS station, by definition, is not moving, updating its position more often than every 30 minutes is superfluous and counterproductive, so every 30 to 60 minutes is a reasonable interval. Some versions of the *APRS* software set rates to 20 minutes and others to 30, but you can set the rate as desired. For our current fixed location application, set your beacon rate to 30 minutes or BEACON 180 on most TNCs (180 = 1800 seconds = 30 minutes).

The beacon text is the second important parameter that needs to be initialized. Because we're only talking about a fixed APRS station, there is no need for a GPS device. All you need to know is your location. Borrow a GPS receiver just long enough to determine the latitude and longitude of your station. With that information, you can set up your BTEXT. For example, BTEXT for my fixed station is:

/120800z3300.28N/11702.39W-PHG2230/Rick in Poway, CA

If you don't know your latitude and longitude, or if you don't want to tell the world your exact location, the standard procedure is to use your six-character grid-square designator, which provides accuracy to within a few miles. For example, here is an alternate beacon text for my location:

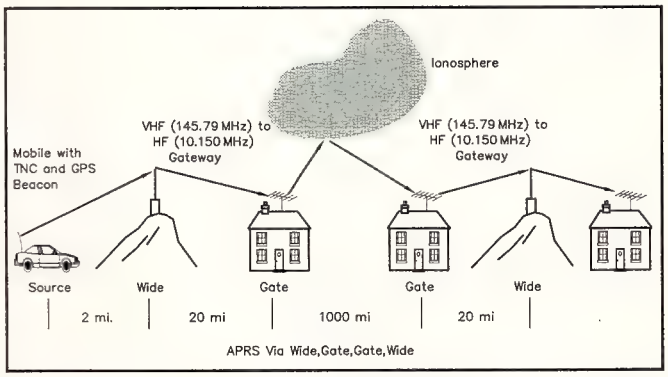
/120800z[DM13la]-PHG2230/Rick in Poway, CA

All of these strings may seem like gibberish, so let's examine them in a little more detail. The first field consisting of the single slash character (/) indicates you are a fixed station with no APRS messaging capability. The second field uses the format, DDHHMM to indicate the date and time. Normally this field contains the current time and date based on real-time GPS information, but since we don't have a connected GPS for this system (or a real-time clock embedded in the TNC), the accepted practice is to specify the date that you started your *APRS*. In our example, 120800z indicates that the system was started on the 12th day of the month at 0800 Zulu Time. The next two fields contain the latitude (3300.28N) and longitude (11702.39W), or a single field for the six-character grid square (DM13la). The next character is a hyphen (-), which indicates that you are a fixed station at your home. There are nearly 200 symbols (characters) available that will designate your station as being in anything from an ambulance to an airplane!

The Power Height Gain (PHG) field contains four digits that represent the power of the transmitter, the height, gain and radiating pattern of the antenna. For our example, 2230 represents a transmitting power of 4 W, and the antenna is 40 feet high with 3 dB gain, with an omnidirectional radiating pattern. If this has you scratching your head in bewilderment, don't worry! The *APRS* documentation (see PROTOCOL.TXT in the *APRS* software bundle) explains it in detail. We'll come back to this in a moment.

After the PHG field you append a comment. This is typically your city and state, name and perhaps a short salutation ("Howdy!").

The only other major TNC parameter that must be set is



Ever wonder how a 2-W, 2-meter mobile station can broadcast its location to the world? With the digipeater path shown, the mobile extension can hop from one station to the next to reach almost anywhere. However, this is not an efficient path and is displayed here to show a concept rather than to propose a realistic use of the APRS network.

APRS on the Web

You say you can't get on packet? You can still marvel at the APRS information that is available through the Internet. If you have a Web browser and Internet access, you can see live data from Amateur Radio operators around the country and from satellites circling the globe. You can also play back recorded journeys of balloons, cars, and sailboats from history files.

The Kansas City APRS Working Group offers an excellent page at **http://www.kcaprs.org/**. Of particular importance is the link to *Recommended Operating Practices* for APRS users on the Kansas City LAN (Local Area Network). This is a great idea—it aids users in developing efficient networks, which is particularly important for APRS. Also provided is a section on the Kansas City digipeaters, with vital statistics. This page can serve as a model for APRS networking because it not only provides information, it is an excellent coordination tool for the hams in the area using APRS.

Java, the computer language developed by Sun Microsystems, has been available for many years. However, it was not until the advent and widespread use of the Internet that Java has become popular. Amateur operators, and Steve Dimse, K4HG, in particular, were quick to see the potential of using Java to enhance APRS and disseminate information. Steve authored *JavAPRS*, which allows Java-savvy Web browsers to display live APRS traffic. For the Miami, Florida area, point your Web browser to **http://www.bridge.net/~sdimse/javAPRS.html**. There you will find links to many APRS Web sites and the ability to playback previous APRS expeditions such as Steve's 8730-mile journey from Miami to Seattle and back. With *JavAPRS* you can even control the display. You can zoom in and out, up or down, change the center of your viewing area, scroll the map, change colors and more. If this doesn't get you excited, check your pulse.

No amount of APRS Web surfing would be complete without a visit to the Home Page of Bob Bruninga, WB4APR, the father of APRS. At **http://web.usna.navy.mil/~bruninga/aprs.html** you will not only find the position of live VHF and HF APRS channels but also the location of GPS satellites. Terrestrial links are provided to boats, aircraft, and more. This page is an impressive resource and an excellent source for a quick overview of just how pervasive and powerful APRS has become. Of particular importance is a link to **http://web.usna.navy.mil/~bruninga/digis.html**, which shows all known APRS digipeaters nationwide, a *must-see* for all newcomers. It is a live display that will let you see the activity in your area.

The Atlanta Area APRS Home Page at **http://www.mindspring.com/~rwf/aprs1.html** provides an excellent description of APRS, the activities of the Atlanta APRS group, and links to other APRS Web sites. Again a good example of how the Internet can help coordinate and disseminate information.

The authors of the Apple Macintosh and *Windows* version of APRS software, Keith Sproul, WU2Z, and Mark Sproul, KB2ICI, provide excellent Web pages at **http://aprs.rutgers.edu/index.html** and **http://msproul.rutgers.edu/APRS/MacAPRS.htm**. There you can download all three versions of *APRS* software (Mac, *Windows*, and DOS). Also provided are a large number of detailed maps and documentation on virtually any APRS subject.

For information on northern Illinois APRS activity, visit **http://tbcnet.com/~jleonard/n9vjq.htm**. There you will find links to other sites along with a *JavaAPRS* real-time display. Of particular interest are two links that show the path taken by a balloon flight. The 3-D view is particularly interesting.

For northern California, Bob Wilkins, N6FRI, provides an excellent APRS page at **http://www.ccnet.com/~rwilkins/aprs.html**. There you will find links to numerous other APRS Web pages around the country. You will also have a good starting point for finding information on the Global Positioning System (GPS). To aid APRS frequency coordination, a list of the digipeaters in the area is also provided.

Our neighbors to the north in Ontario, Canada, are no strangers to APRS. Take a trip to **http://www.peel.com/javAPRS.html**, where you will find real-time APRS traffic (updated every 15 minutes) as well as the ability to view traffic in previous periods (ie, 15 minutes to 24 hours).

The future of APRS is constantly expanding. For example, take a trip to **http://web.usna.navy.mil/~bruninga/aprs.html** to find how you can have GPS on any radio using the MIM or MIC-EAPR. Pictures and further information on this unique technology can be found there.

The Tucson Amateur Packet Radio (TAPR) is the central point for virtually all Amateur Radio digital communication. Go to the APRS special interest group page at **http://www.tapr.org/tapr/html/sigs.html**. From there you will find a wealth of APRS information and resources.

For those with lots of questions, point your browser to **http://home.sprynet.com/sprynet/ku0g/APRSFAQ.HTM** to examine the APRS FAQ (Frequently Asked Questions). Gary Wells, N3HCP, has developed a page specifically for the newcomer at **http://users.nb.net/~gwells**. If you need more help, join the APRS mailing list by sending e-mail to **listserv@tapr.org** with **subscribe aprssig [FirstName LastName]** in the body of the message. When you ask a question, your message is sent to thousands worldwide and an answer often arrives within minutes.

UNPROTO (unprotocol). Like the PHG parameter, we will cover this in more detail when we discuss networks but, for the present, a good starting path for a fixed station is:

APRS VIA WIDE, WIDE

That's all there is to it. Slight variations may be required depending on your TNC. In most cases, however, it is as easy as setting BTEXT, BEACON, UNPROTO and tuning to 145.79 MHz. At this point you are able to see APRS activity and transmit your location to others. Now let's hit the road.

Taking It on the Road

If you intend to go mobile with APRS, you must have a GPS receiver because your position is constantly changing. The good news is that GPS receiver prices have dropped drastically. With a little careful shopping you'll find a useable GPS unit for under $200. Just make sure it has a NEMA-compatible data port.

Connecting the GPS to the TNC can be a bit tricky, but your TNC manual should offer a step-by-step description. Most GPS devices provide 4800-baud RS-232-compatible signals in a standard format that GPS-friendly TNCs can easily digest.

For mobile use, we are still typically concerned with three parameters: BTEXT, BEACON, and UNPROTO. If the TNC is configured properly, it will take the information provided by the GPS (latitude, longitude, time) and automatically use that as the beacon text. The beacon rate should be set to one-minute intervals, since we are now moving and need to update our position more frequently. Lastly, the UNPROTO path must be set. In our fixed station example, the UNPROTO path was set to APRS VIA WIDE, WIDE. For mobile applications it is common practice to add the digipeater RELAY so that our final path is:

APRS VIA RELAY, WIDE, WIDE

The APRS Network

After spending a lot of time looking at moving dots, I started to examine the packet frames to see exactly what was being transmitted. I had been in packet radio a few years, but seeing frames with a digipeater path of RELAY, WIDE, WIDE, or WIDE, WIDE, GATE, and virtually every other combination imaginable, I was lost! In this section I'll give you some examples of digipeating paths and explain why they are used. Let's pause for a quick

AX.25 packet refresher course first.

APRS uses the AX.25 protocol, a wireless point-to-point protocol based on the international standard X.25 protocol. Enhancements to the X.25 protocol were necessary to accommodate the unique requirements of wireless communication and the Amateur Radio environment in particular. X.25 is a connection-oriented protocol. This means that it assumes that two stations will connect to each other and handshake before any information is passed between them. However, this would mean that Amateur Radio operators could never call CQ. Remember: By definition a CQ is a one-way broadcast to an unknown destination. For this reason, UI (unnumbered information) frames are provided in AX.25. This is important because all APRS information uses UI frames, so that a single packet can be heard by everyone. When an APRS station broadcasts its location, it has no idea if it is being heard, nor does it expect a response (acknowledgment) that the packet has been received. This means that the packet is operating on an unreliable channel. Because it is only a matter of a few minutes before the information is repeated again, a lost packet for APRS is not as critical as a lost packet in normal packet communication.

Since most APRS activity is on 2 meters, transmission is limited to the line of sight. Add the limitation of mobile communication where the power transmitted is low (typically a few watts) and the antenna system is limited (a whip), it would appear that a mobile APRS station has little or no chance of being heard outside a radius of a few miles. This obstacle is overcome with a little help from your friends. Other local, fixed APRS stations with more power and better antenna systems serve as strategically placed digipeaters. It is through the use of these digipeaters that a mobile can broadcast its location to a large metropolitan area—and beyond.

Let's look at a standard packet station example:

C KK5SU VIA WA3ZFE, KC5PVL

In this example, we are sending a packet to KK5SU through stations WA3ZFE and KC5PVL. This is known as *digipeating* and many packet users do it when the desired station cannot be contacted directly. WA3ZFE receives the packet first and rebroadcasts it to KC5PVL, who repeats it again, sending it to its final destination, KK5SU. This is old hat to the veteran packet user, but its importance cannot be overemphasized in APRS work. Digipeating is a powerful tool and forms the building blocks for APRS networks. It allows the APRS users to extend their range far beyond line of sight.

For standard packet station communication, we know the call signs of the digipeating stations (WA3ZFE and KC5PVL, in the previous example). The same cannot be said for APRS. So how do you digipeat through a station when you don't know its call sign? No problem. All you need to know are the standard *alias* names. Any station that is set up to respond to an alias is capable of handling your packets automatically, even if you don't know its call sign!

Commonly used aliases are: RELAY, WIDE, and GATE. Each alias denotes a very different type of station. A RELAY station is one with a limited range (a few miles). Clearly mobile stations and some fixed stations fall into this category. A WIDE station is usually a dedicated station with wide local or regional coverage. A GATE station has a very wide coverage area (500 miles or more). Most, if not all, GATE stations are really gateways from 2 meters to 30 meters. If you're monitoring your local 2-meter APRS network and suddenly see a symbol showing a station 500 miles away, chances are it is a packet relayed through a GATE. (Depending on your station setup, it might also be a packet that reached you directly via meteor-scatter. Yes, they're doing APRS meteor scatter, too!)

We are now prepared to return to the topic of the PHG (power, height, gain) parameter. As every Amateur Radio operator knows, the line-of-sight range of a station is primarily a function of PHG. Therefore, if we look at the coverage circles of local APRS stations, we are in a good position to develop digipeating paths that are customized to our particular location. Figure 1 shows coverage circles for southern California. If we examine these displays and we determine that we cannot hit a WIDE digipeater, then we would be justified in adding RELAY as the first hop of our digipeating path. In a similar way, if we know that we can hit two WIDE digipeaters, we may wish to use a digipeater path that specifies the call sign of the digipeater rather than using the generic WIDE alias. In this way, we bring up only one WIDE station and reduce channel congestion in the process.

There is a great deal more that can be said regarding the APRS network protocol. However, that is often best learned through on the air trial-and-error and a little experimenting with your particular system. Consider investing in a book that will become your APRS reference: *Getting on Track with APRS* by Stan Horzepa, WA1LOU. It's available from your favorite dealer or directly from ARRL Headquarters.

Conclusion

A lot has happened to APRS since its humble beginnings. I think even Bob Bruninga is surprised at what has become of his idea. New applications and uses are being developed constantly. Imagine enjoying your next fox hunt from the comfort of your car with a laptop computer and a graphical display. Imagine the ability of the Amateur Radio community to provide the National Weather Service with 100,000 weather data points throughout the country. Imagine the ease and accuracy of tracking people and vehicles during expeditions or emergencies. Imagine no more. It is here now; come and join the fun!

[Check out this month's "Up Front in *QST*" for a photograph of Bob Bruninga, WB4APR, the author of *APRS* for DOS, and Keith Sproul, WU2Z, the author of *MacAprs* and *WinAprs*, which perform the same APRS functionality for Macintosh and *Windows 95* platforms, respectively.—*Ed.*]

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New Products

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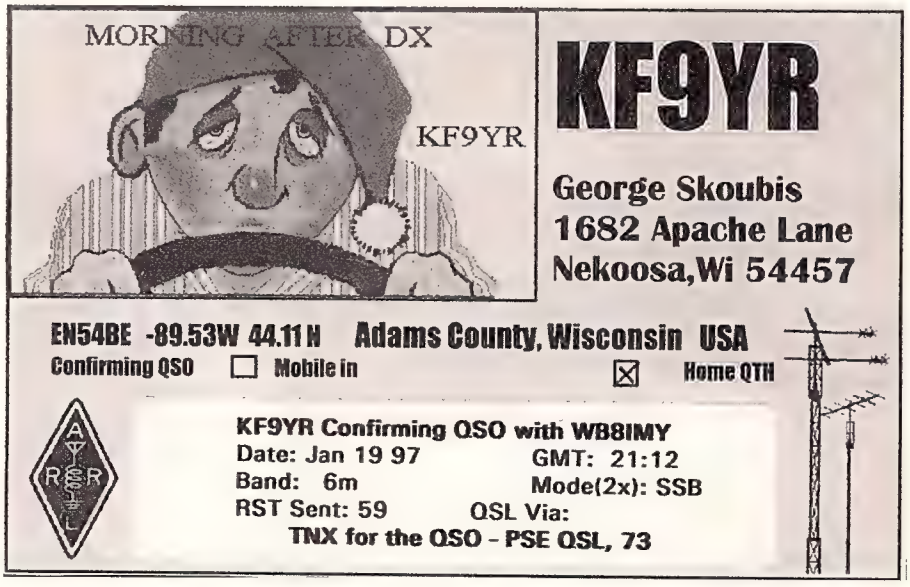
The 2880 comes with a rubber holster, test leads, a serial cable and software for your IBM-compatible PC. Price: $189. For more information, contact B+K Precision at 6470 W Cortland, Chicago, IL 60607; tel 773-889-1448, fax 773-794-9740.

By Steve Ford, WB8IMY

Tallyho 6 Meters!

Fire up your 6-meter radios. The summer "E season" is upon us!



As the weary soul depicted on KF9YR's QSL card could tell you, a 6-meter band opening can occur almost any time—even late at night!

After 26 years of hamming I thought I was well beyond the adrenaline-rush experiences of my early days. You know what I'm talking about. It's that gooseflesh sensation you get when you bust your first DX pileup, work your first satellite, run your first net, and so on.

As we age within the hobby, must the well of excitement inevitably run dry? Do we find ourselves humming the old Peggy Lee hit, "Is That All There Is?"

Hardly! Sometimes all you need is the desire to break old habits and explore new frontiers. When you stumble upon something unexpected, it's a nerve-jangling wake-up call!

The Worst 6-Meter Station on Earth

The winter doldrums weighed heavily upon me last January. It was too cold to play outside, so my three-year-old daughter was bouncing off the walls. I did my best to help, but how many times can you play hide-and-go-seek before you run out of camouflage options? (I knew it was getting out of hand when I started painting my face fatigue green and crouching in the basement.)

A friend took pity on me and suggested that I try my hand at 6-meter DXing during the ARRL VHF Sweepstakes, January 18 through 20. "You definitely need some new challenges," he said as I crawled beneath the guest bed.

I must confess that I was a total 6-meter greenhorn. The only operating I had ever done was a bit of FM work. But, thanks to my generous friend, I managed to get my hands on a battered Yaesu FT-680 transceiver. The little 10-W rig not only offered 6-meter FM, it had SSB as well. My friend assured me that I wouldn't need an elaborate antenna to chase SSB DX when the band was open. That was good news because I had the worst 6-meter antenna system you could imagine.

My poor excuse for an antenna was a 10-meter dipole hanging between my attic rafters and fed with about 30 feet of Belden 8214 coax. Using an MFJ tuner, I managed to get the antenna to load on 6 meters—barely. When I calculated the power lost to feed line attenuation (thanks to a sky-high SWR), I was only radiating about 7 W. It doesn't get much worse than that.

Yes, I could have simply shortened the antenna to make it resonant on 6 meters, but getting into my attic is a long, painful experience. For the sake of a trial run, using a tuner is *much* easier!

CQ Contest

The first hour of the contest was hot and heavy. Between household chores and my daughter's naps, I wandered by the radio and worked whatever local stations I could find. By the time Sunday afternoon rolled around, there wasn't much activity. All the locals had worked each other and Mother Nature was being stingy with her band openings.

At about 2100 UTC I decided to prowl the band one last time. As I scanned up from 50.125 MHz, I heard the usual crop of locals, including Emil Pocock, W3EP/1, who lives about 20 miles away. Suddenly, I tuned across a very strong signal. The S meter on my transceiver lit up like a Christmas tree. "Probably another local," I muttered as I kept tuning. I immediately came across another super-strong station. "How odd," I said to no one in particular.

Battle Stations!

As I reached for the VFO knob again, I heard, "CQ contest from K8RS, Okemos, Michigan." *Michigan?* Why, that's at least 500 miles away. What the...?

And then I felt a tingling sensation racing up both arms. My throat tightened and I could feel the hair standing up on the back of my neck. I had read about it for years, but had never actually experienced it....

"Oh, my gosh! Sporadic E!"

Signals seemed to explode out of the noise. I heard stations in Michigan, Wisconsin, Ohio, Indiana and Illinois. Everyone was making contacts at a furious pace. Could I possibly get in on the action?

"KF9YR—contest!"

"WB8IMY portable 1," I answered.

"WB8IMY portable 1, you're a strong 5 and 8 in Wisconsin, grid EN54."

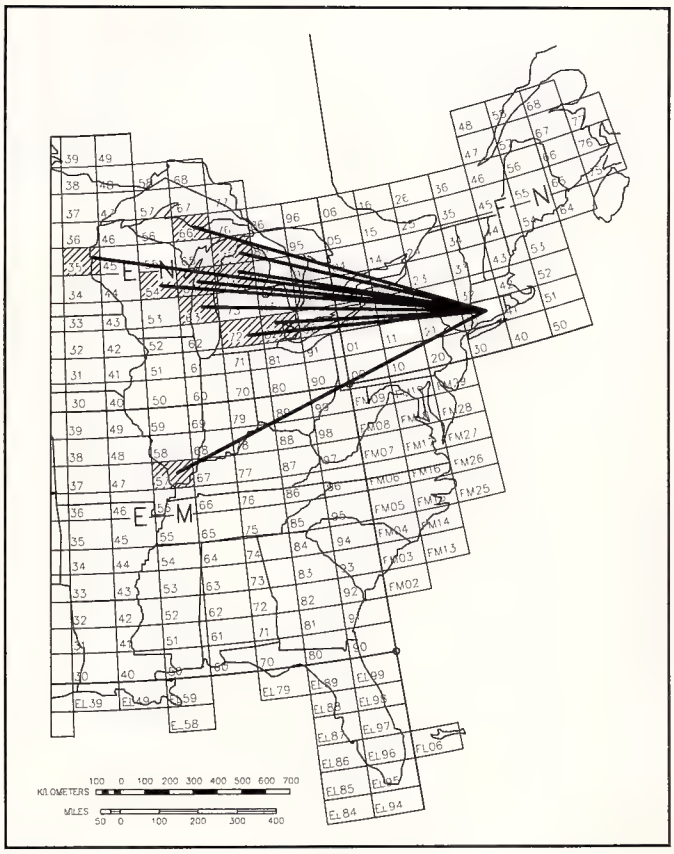


Figure 1—With only 10 W and an attic dipole I was able to make contacts in 10 midwestern grid squares during the sporadic E opening that took place on the afternoon of January 19, 1997.

What's Your Grid?

When 6 meters opens and the action is hot, you'll hear stations asking each other for their *grid squares*. These letter/number combinations are always in high demand. Most VHF awards are based on collecting a certain number of grid squares. (In the case of the 6-meter VHF/UHF Century Club award, you need to confirm 100 grids.) All VHF contest exchanges include grid squares—each new grid square you add to your log is a valuable score multiplier.

So what *is* a grid square?

The Maidenhead Grid Square system is a way of dividing up the world into little rectangles along lines of latitude and longitude. This system is convenient for determining the general locations of stations. If I tell you that I live in Wallingford, Connecticut, you'll spend several minutes trying to find our little town in an atlas. But if I tell you that I'm in grid square FN31, you can ballpark my location on a grid square map in about 5 seconds.

So how do you know which grid you inhabit? If you know your latitude and longitude, you can use the manual method described in *The ARRL Operating Manual*. You can also determine your grid square on line at **http://www.arrl.org/locate/gridinfo.html**. If you (or a friend) own a GPS receiver, see if it has the ability to display your location in grid-square format. Many models, such as the Garmin 38, do.

The ARRL sells large North American grid locator maps for only $1. If you're gunning for an award, or if you just want to see the "aftermath" of a band opening, these maps are quite handy. I use a yellow marker to color in the grid squares that I've worked.—*WB8IMY*

I felt as though someone had slapped me across the face. This was impossible!

"Uh...you're 59 in FN31," I replied uncertainly.

"Thanks for FN31. Good luck in the contest!"

I tuned up the band, answering more calls and bagging more contacts. It reminded me of the time I was on a fishing excursion off the New Jersey coast. One moment we were sulking on the deck chairs, feeling seasick and wondering why we had wasted our money. The next moment we were over a school of tuna and our reels were singing!

As I completed a contact with a station in Illinois, someone (I didn't catch his call sign) shouted, "The band is *hot*, Steve! Tallyho!" Seven watts or one thousand watts—it didn't seem to make a difference. If you could hear them, you could work them.

An hour passed before I knew it. Then, as suddenly as it began, the sporadic E vanished. Signals bobbed up and down...once, twice, and then went down for the third time. Gone. W3EP/1 continued to pull in a few contacts, but after another 15 minutes or so, it was over.

I hung up my microphone and settled back into the chair. My heart was still pounding as I examined my log. With just a few watts and a lousy attic dipole I had worked stations in 10 midwestern grid squares (see Figure 1). No wonder they call 6 meters "the magic band"!

The Nature of Sporadic E

Sporadic E is a strange beast, and its origins are not well understood. Basically, it is a phenomenon caused by small patches of ionization moving around in the E region of the ionosphere. Sporadic E is fickle with its blessings. The band could bust wide open for you, while a friend 10 miles away hears nothing at all. If you're in the hot zone, your signals can span 1400 miles in one hop. Multihop paths can span the entire continent!

Sporadic E is most likely to occur during the summer months, although there is a "season" in December and January as well. Sporadic-E band openings tend to concentrate in the mid-mornings and late afternoons, but you must be constantly on your guard; sporadic E can appear at any time. (That's why they call it *sporadic*!)

As my own experience proves, sporadic E is the great equalizer. Even if your station is as poor as mine, you can make dozens of contacts when "the E" is in charge. Because sporadic E openings can close at a moment's notice, contacts are usually brief. Many 6 meter operators are chasing grid squares for awards or contest multipliers (see the sidebar, "What's Your Grid?"). They want to hook as many contacts as possible while the fishing is good.

I'll Be Listening

By the time you read this article, the summer "E season" will be under way. Although there can be extended dry spells, you can expect to encounter sporadic E almost every day. Park your radio on 50.125 MHz, crank up the volume, then increase the squelch until the noise stops. Now go about your normal routine. If you hear sounds from your radio room, it may mean that a band opening is in progress. If you own a rig with scanning features, set it up to scan from 50.125 to about 50.200 MHz.

And don't miss the ARRL June VHF QSO Party, June 14 though 16 (details were in last month's *QST*). If a sporadic-E opening occurs, you'll hear tons of signals as the contesters scramble to work new grids. One of those signals will be mine. You'll recognize me as the guy who can't seem to stop shouting into his microphone. Adrenaline does that to you! QST

Product Review

*Edited by **Rick Lindquist, N1RL**• Senior Assistant Technical Editor*

Ten-Tec Centaur Model 411 HF Linear Amplifier

By Rick Lindquist, N1RL
Senior Assistant Technical Editor

The Centaur represents Ten-Tec's attempt to go the extra mile in offering a low-end HF linear amplifier. The Centaur certainly is not the first "three-hole" 811A amplifier on the market, but the folks in Tennessee reckoned they could go a few steps beyond what was already out there, at the same time keeping the price in the same general ballpark. The result is an economical 600 W class amplifier that offers QSK as a standard feature—the only one in this price category to do so—plus hot-switching protection, pi-section input filters and other niceties.

Let's face it. Not everyone can handle the $2500 cost of a big-power amp—and not everyone needs that kind of power anyway. At this point in the sunspot cycle, though, some ops would just like a little leverage on the bands. Sometimes—just sometimes—the few hundred additional watts an amp like this can offer will make the difference between snagging that new one, making a sked or continuing an enjoyable ragchew under changing or less-than-optimal conditions. A little desktop amplifier like this can certainly fill a lot of gaps.

In typical Ten-Tec fashion, the Centaur is a fairly compact, straightforward box—nothing fancy. On the outside, it has vernier-driven **LOAD** and **TUNE** controls (calibrated with 0-10 markings on each knob's apron); a bandswitch (marked for 160, 80, 40, 20, 15 and 10 meters, but the amp shares positions for 30, 17 and 12 meters); two lighted multimeters (one reads either grid current or power output in watts; the other reads either plate voltage or plate current); a row of mini-toggle function switches; and a big rocker-style **POWER** switch to turn the unit on.

Inside the box (and visible through the ventilation holes in the top of the gray steel cabinet) are three Svetlana 811A tubes, a fairly husky transformer (1.5 kVA CCS and accounting for about half the weight of the amplifier), the tuning capacitor, and other components (see photo). The parallel 811As are operated in class AB_2 grounded-grid configuration with a nominal 550 mA of plate current and approximately 1700 V of plate voltage (at full load). The Centaur can operate satisfactorily from either 120 or 240 V ac input. A four-inch muffin-type fan moves 100 CFM of air across the three output tubes, so the amplifier runs quite cool (*much* cooler than my Collins 30L-1, which has four 811As in the output but a rather insubstantial-looking cooling fan). The excellent cooling should keep the 811As running for a long time, assuming you don't otherwise abuse them. The major tradeoff here is in fan noise (more on that subject later).

The Centaur is rated at 600 W output on SSB and CW on 80 through 15 meters, 500 W output on 160, 12 and 10 meters, and 400 W output on FM, RTTY or SSTV. (Ten-Tec says that by tuning up for full SSB or CW power then setting the carrier output at 150 W, the amp can be used for AM as well.) It takes the better part of the output of a typical transceiver to drive the Centaur to full output—90 W or so would do it in most cases, we found. We got the rated power on all bands except 17 meters, where it was much closer to—but not quite—500 W. While the Centaur manual advises keeping the plate current at or below 550 mA during tuneup, we found that the tubes drew up to 750 mA on some bands when the linear was tuned for rated output. Ten-Tec said this is normal. (My personal philosophy with an amplifier like this would be to run it at 450 to 500 W. There's precious little to be gained by pushing it to its absolute limits.)

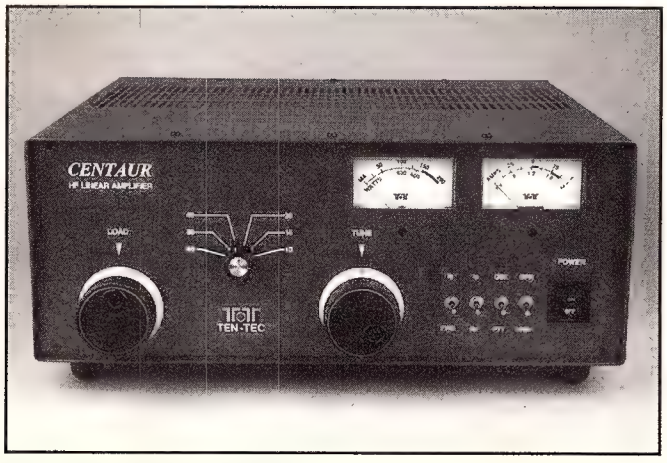
THE BOTTOM LINE

An economy-class "half-gallon" 811A linear amplifier with QSK standard. Works great, runs cool, but some ops might find the blower a little loud.

Setting up the Centaur is pretty easy. It comes from the factory wired for 120 V ac use, but if you've got 240 V available in the shack, it's quite simple (and probably advisable) to change two jumpers—accessible via a rear-panel "inspection plate"—plus a couple of fuses and the wall plug for 240-V operation.

As it comes from the factory, the Centaur does not operate on 12 or 10 meters (per FCC requirements). To add these bands, users first must send a photocopy of their Amateur Radio license to Ten-Tec requesting the free modification package. In return, they'll receive a small circuit board that installs via the "inspection plate" access panel. It takes about five minutes and involves no soldering.

The rear panel has SO-239 connectors



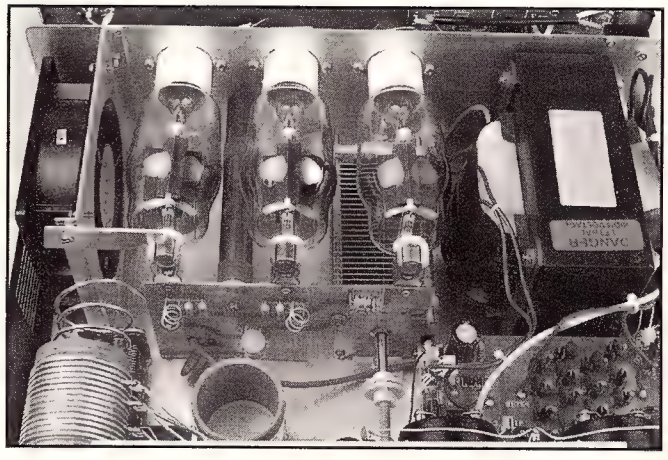


Table 1

Ten-Tec Centaur Model 411 HF Linear Amplifier, serial number 01A10087

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 160, 80, 40, 30,* 20, 17, and 15 meters; 12 meters and 10 meters by modification.	As specified (can be modified by licensed amateurs for operation on 12 and 10 meters).
Power output: 600 W on SSB and CW, 80-15 meters; 500 W on 160 and 10 meters. 350-400 W on RTTY or SSTV (depending on band).	As specified, except 500 W measured on 17 meters.
Duty cycle: SSB, continuous voice modulation, at rated PEP output; CW, 50% duty cycle, no time limit at rated PEP output (30 seconds maximum continuous key-down).	As specified.
Gain: Not specified.	Approximately 8 dB, typical.
Drive power required for full output: 90-100 W, typical.	As specified.
Spurious signal and harmonic suppression: Meets or exceeds FCC requirements.	≥48 dB.
Intermodulation distortion (IMD): Not specified.	See Figure 1.
Power supply requirement: 120 V ac at 12 A; 240 V ac at 6 A.	As specified.
Size (HWD): 6×15.5×13 inches; weight: 40 lb.	

*The FCC-specified maximum legal output on the 30-meter band for US amateurs is 200 W PEP.

Expanded Product Review Report Available

The ARRL Lab offers an expanded test result report on the Ten-Tec Centaur Model 411 HF Linear Amplifier that gives in-depth, detailed technical data on the amplifier's performance, outlines our test methods and helps you to interpret the numbers. This report includes full-power spectral purity charts for each band and a chart showing how it stacks up against similar, previously reviewed units.

Reports are $7.50 for ARRL members and $12.50 for nonmembers, postpaid. Request the Ten-Tec Centaur Model 411 Test Result Report from the ARRL Technical Department, 225 Main St, Newington, CT 06111 (personal checks accepted). For credit card orders only, call 860-594-0278.

for the RF input and output. The rear panel also has an **ALC** input jack and an **ALC CONTROL**. If you plan to take advantage of the QSK (for some users, this will be the main reason for buying this amp), you need to wire your keying line through the Centaur. This is accessible through RCA jacks on the rear of the amplifier. If you have a late-model Ten-Tec transceiver with **TX OUT** and **TX EN** jacks (such as an Omni VI), connecting these to the **KEY IN** and **KEY OUT** lines, respectively, takes care of keying the transceiver for other modes. For other transceivers, there's a **PTT/VOX** jack. There's a wing-nut connection for ground.

The first thing you'll notice when you push on the **POWER** switch is that the whole box will shudder a bit. This is disconcerting, but normal. The next thing you'll certainly notice is the rapidly increasing decibel level of the cooling fan as it accelerates to warp speed. As noted, Ten-Tec moves *a lot* of air through this amp, and it makes a bit of noise in the process. The high blower noise level was the only major complaint about this otherwise well-thought-out and well-built economy amplifier. We checked sound levels of some other amps and found the Centaur to be noisier than even some higher-power units. Ten-Tec acknowledges that the fan is loud, but a spokesman said it was a design decision to incorporate lots of air flow. Ten-Tec says it's been unable to come up with a quieter means of doing so that's within economic reason and does not compromise tube life and component longevity. Even so, many ops would probably be willing to sacrifice some tube life for a quieter-running amp. After all, new 811As are relatively inexpensive.

The mini-toggle switch next to the **POWER** switch selects **STBY** (standby) or **OPR** (operate). By following the directions in the *Operator's Manual*, any operator who's at all familiar with how a tube linear like this tunes and works will pretty quickly get the hang of the tuning procedure. If this is your first amp, just follow Ten-Tec's clear instructions in the *Operator's Manual*. The main thing (as Ten-Tec warns) is to avoid overdriving the 811As. This is one excellent reason for including separate meters to simultaneously read the 811A grid current and plate current. By the way, the **LOAD** and **TUNE** control knobs had rubberized grips and spinner holes. Their vernier action was silky smooth.

Another of the front-panel toggle switches lets you select **QSK** or **PTT** operation. For CW, the QSK was super. Other ops—including those who take pride in having a critical ear for keying—said it sounded great. For a CW hand like me, not having to shut off my transceiver's full-break-in when running the amp was a gigantic plus. On SSB, the amplifier performed well too. No splatter or distortion was noted by other stations, and our Lab tests indicated good IMD performance (see Figure 1).

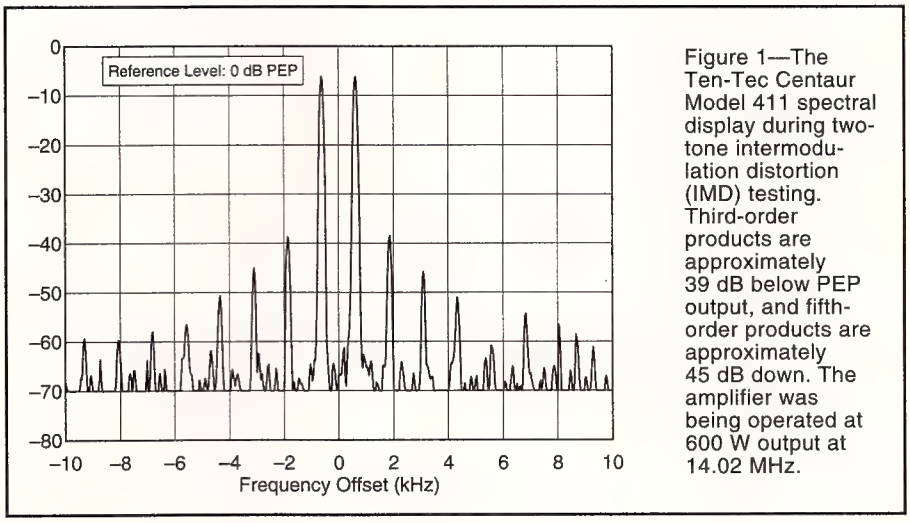


Figure 1—The Ten-Tec Centaur Model 411 spectral display during two-tone intermodulation distortion (IMD) testing. Third-order products are approximately 39 dB below PEP output, and fifth-order products are approximately 45 dB down. The amplifier was being operated at 600 W output at 14.02 MHz.

The built-in wattmeter is handy. The one in our review unit measured to within approximately 10%, worst-case. It was most accurate on 40 meters, where our Lab wattmeter and the Centaur's wattmeter agreed. On other bands, it read up to 10% low.

Ten-Tec did quite a nice job on the *Operator's Manual*. It's complete and to the point. There's a tuning chart to help you get in the ballpark while tuning up, plus a chart where you can record actual settings for each band; a troubleshooting chapter; detailed descriptions of most individual circuit boards—right down to pictures and PC trace templates; and schematic diagrams of everything. There was no parts list detailing the values of components called out on the schematics, however. In-

structions are step-by-step. My favorite line of the manual came in Chapter 1—Installation: "If any of your home entertainment electronic devices have RF leaks, the Centaur will find them."

Ten-Tec has done a fine job of designing and putting together the Centaur, especially when you consider its price tag. At the same time, the amp's very efficient cooling system comes at the cost of some noise. The price and features are certainly right, however, so if you can manage this shortcoming, the Centaur could be your next—or your first—linear.

Manufacturer: Ten-Tec Inc, 1185 Dolly Parton Pkwy, Sevierville, TN 37862; tel 423-453-7172; fax 423-428-4483. Manufacturer's suggested retail price, $750.

AOR AR7030 Communications Receiver

Reviewed by Paul Danzer, N1II
Assistant Technical Editor

Sounds good! That was my first impression when I turned on this little black box with its Euro-styled front panel and a few—very few—knobs and push buttons. In fact, the radio's exterior styling really distinguishes it from the traditional, utilitarian approach of most general-coverage sets. It also has a remote-control box, similar to ones that commonly come with VCRs and TV sets, something that sets it apart from its peers (and makes it look for all the world like a satellite TV receiver). This is definitely not ham gear!

The overall effect of the AR7030—with its swooping display window; black, brushed-finish front panel; textured-finish case; and flush, hex-head hardware—is striking. It's compact, quite handsome and unique, but its real beauty is more than skin deep. The AR7030 performs very well too, and lives up to its designation as a "high dynamic range general-coverage receiver." Our relatively early production unit AR7030 did not *quite* meet AOR's dynamic range specification of 100 dB (measured at 12.7 MHz), but it came quite close at 14.2 MHz (see Table 2).

To put it into a ham's perspective, our original AR7030's dynamic range performance was a bit better than that of the Yaesu FT-1000MP (see "Product Review," *QST*, Apr 1996) but not quite as good as the ICOM IC-756 (see "Product Review," *QST*, May 1997). That certainly puts it in good company.

I may have set a new record. Within three minutes I had pushed enough controls to have a totally unintelligible display on the front panel, no output from the speaker and no clue as to what to do. Okay, when in doubt, read the manual—and there on page 2 is a paragraph with a bold-faced title: "**Overview—read *THIS* if nothing else.**" Then, three paragraphs down, is the sentence: "If you really mess up the settings, a LOAD DEFAULT facility has been included so that you can return the set to its out-of-box condition (except for memory contents)." Push one button, turn one knob, push a second button (all well marked) and we are back in business. I wonder how they knew I would do that?

What's So Special about this Receiver?

The AR7030 is the result of a collaboration between AOR and well-known UK designer John Thorpe. The AR7030 is built in the UK, and it has just about every feature you want—IF gain, RF gain, BFO, passband tuning, treble and bass controls, and memory storage of frequency, mode and all settings (100 memories!). You can save (and load) up to three receiver setups in the special setup memories (A, B or C).

Want to listen to music on a shortwave broadcast band? Select AM or synchronous AM, set the tone controls, memorize a few frequencies and you are ready to go! SSB your choice? Preset the filter bandwidth to 2.0 kHz, the mode to USB or LSB and memorize the settings.

Want to change from one preset to another or start over with a new mode, frequency, gain and filter? You can use either the front panel controls or a remote control unit.

Normally, I would not open up a review unit. We usually leave that to Mike Gruber, W1DG, and the other folks in the ARRL Lab. But in this case, with so much crammed into one small box—and the use of hex-head screws—it was a challenge I couldn't resist. And, inside, it is *beautiful!* A mixture of DIPs and surface-mount components sat on a shiny board with readable component labels. Looking for test point TP4? The label is fully visible, and not under a nearby component. Even the thickness of the metal case was impressive.

BOTTOM LINE

This is a slick, attractive, quality-made receiver with practical and aesthetic appeal—and with a price tag to match. It's a terrific performer, but the use of menus instead of dedicated controls might confound some users.

The AR7030 features dual conversion, with IFs at 45 MHz and 455 kHz. AOR claims the IF filters are "self-aligned by the receiver, using advanced microprocessor control." According to AOR, the displayed filter bandwidth actually represents the bandwidth measured by the receiver!

As you would expect from a modern receiver, two VFOs are included, A and B (which AOR calls Active and Background, respectively). Each VFO has an associated memory of mode, volume, tone, filter bandwidth, passband tuning, BFO frequency, IF gain, RF gain or attenuation, AGC, squelch, scan delay time, scan mode and, of course, frequency. These settings, depending on the mode selected, can be stored in each of the available 100 memory locations.

The front panel has a comfortably weighted tuning knob with adjacent **FAST** and **MODE** controls. The tuning knob has a nice quality feel to it, and the faster you spin, the greater the tuning rate. A **FAST** button allows you to quickly move the frequency to anywhere in the "dc" to 32-MHz range. The AR7030 tunes in 2.7-Hz steps, but you won't hear any chuffing in this set. Two **MODE** push buttons cycle through the available modes—AM, synchronous AM, NBFM, data, CW, LSB and USB.

One knob and four push buttons under the display are keyed to the display. Their use depends on the menu settings. They are truly multifunction controls, and this where this receiver gets interesting—or confusing, depending on your point of view.

The AR7030 requires 15 V dc, which, in the case of our unit, was supplied by the external ac adapter that came with the radio. AOR says the radio will operate using a power source from 12 to 15 V dc but "with degraded performance at 12 V."

Table 2

AOR AR7030 Communications Receiver, serial number 100344

Manufacturer's Specifications	*Measured in ARRL Lab*
Frequency coverage: 0-32 MHz.	As specified, with usable sensitivity to <20 kHz.
Modes of operation: AM (envelope and synchronous),USB, LSB, CW, DATA, and NBFM.	As specified.
Power requirements: 15 V dc, 1 A (max).	As specified.
Size (HWD): 3.1×9.5×7.6 inches; weight, 4.9 lb.	
SSB sensitivity, 10 dB (S+N)/N, 2.2-kHz filter: 20 kHz, preamp off, 1.9 μV, preamp on, 1.4 μV; 100 kHz, preamp off, 0.73 μV, preamp on, 0.34 μV; 500 kHz, preamp off, 0.5 μV, preamp on, 0.18 μV; 1.0 MHz, preamp off, 0.52 μV, preamp on, 0.19 μV; 5 MHz, preamp off, 0.5 μV, preamp on, 0.19 μV; 14 MHz, preamp off, 0.58 μV, preamp on, 0.23 μV; 28 MHz, preamp off, 0.6 μV, preamp on, 0.23 μV.	CW, minimum discernible signal (MDS), 2.0-kHz IF filter: 180 kHz, preamp off, –122 dBm, preamp on, –131 dBm; 500 kHz, preamp off, –123 dBm, preamp on, –133 dBm; 1.0 MHz, preamp off, –123 dBm, preamp on, –132 dBm; 3.5 MHz, preamp off, –123 dBm, preamp on, –131 dBm; 14 MHz, preamp off, –121dBm, preamp on, –129 dBm;
AM sensitivity, 10 dB (S+N)/N, 70% modulation, 5.5-kHz IF filter: 500 kHz, preamp off, 0.85 μV, preamp on, 0.33 μV; 1.0 MHz, preamp off, 0.88 μV, preamp on, 0.36 μV; 5 MHz, preamp off, 0.86 μV, preamp on, 0.35 μV; 14 MHz, preamp off, 1.0 μV, preamp on, 0.42 μV; 28 MHz, preamp off, 1.0 μV, preamp on, 0.40 μV;	AM sensitivity, 5.5-kHz IF filter, 30% modulation: 3.8 MHz, preamp off, 1.84 μV, preamp on, 0.74 μV; 1.0 MHz, preamp off, 1.84 μV, preamp on, 0.75 μV. 70% modulation: 1.0 MHz, preamp off, 0.78 μV, preamp on, 0.32 μV; 3.8 MHz, preamp off, 0.78 μV, preamp on, 0.32 μV.
FM sensitivity, 12-dB SINAD, 1.5-kHz deviation, 10-kHz IF filter: 28 MHz, preamp off, 1.2 μV, preamp on, 0.48 μV.	FM, 12-dB SINAD, 3-kHz deviation, 9.5-kHz IF filter: 29 MHz, preamp off, 1.22 μV, preamp on, 0.42 μV.
Blocking dynamic range: USB mode, 12.7 MHz, 2.2-kHz IF filter, 9.3-MHz spacing, preamp off, 137 dB.	CW mode, 14 MHz, 100-kHz spacing, preamp off,138 dB, preamp on, 135 dB; 20-kHz spacing, preamp off, 126 dB*, preamp on, 121 dB.*
Two-tone, third-order IMD dynamic range: USB mode, 2.2-kHz IF filter, 10 to 20-kHz spacing, preamp off, 100 dB, preamp on, approximately 98 dB.	CW mode dynamic range, 2.0-kHz IF filter: 1.0 MHz, preamp off, 90 dB, preamp on, 96 dB; 3.5 MHz, preamp off, 94 dB, preamp on, 98 dB; 14.0 MHz, preamp off, 97 dB, preamp on, 97 dB.
Third-order intercept: Preamp off, +27 dBm, preamp on, approximately +17 dBm.	1.0 MHz, preamp off, +13.9 dBm, preamp on, +12.5 dBm; 3.5 MHz, preamp off, +19.9 dBm, preamp on, +18.7 dBm; 14.0 MHz, preamp off, +28.1 dBm; preamp on, +22.0 dBm.†
Second-order intercept point: Preamp off, +85 dBm.	Preamp off, +74 dBm; preamp on, +48 dBm.
FM adjacent channel selectivity: Not specified.	29 MHz, preamp off, 87 dB; preamp on, 88 dB.
FM two-tone third-order dynamic range: Not specified.	29 MHz, preamp off, 87 dB*; preamp on, 88 dB.*
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth): CW, 2.0-kHz filter, 57-1934 Hz (1877 Hz); USB, 5.5-kHz filter, 346-5826 Hz (5480 Hz); LSB, 5.5-kHz filter, 101-5581 Hz (5480 Hz); USB, 2.0-kHz filter, 179-2469 Hz (2290 Hz); LSB, 2.0-kHz filter, 217-2517 Hz (2300 Hz); AM, 5.5-kHz filter, 56-2805 Hz (2749 Hz); AM, 6.5-kHz filter, 61-4000 Hz (3939 Hz); AM, 9.5-kHz filter, 57-4400 Hz (4343 Hz).
First IF rejection: 85 dB or better.	Preamp off, 88 dB; preamp on, 100 dB.
First IF image rejection: 85 dB or better.	Preamp off, 81 dB; preamp on, 75 dB.
Squelch sensitivity Not specified.	At threshold, FM, 29 MHz, preamp off, 0.4 μV, preamp on, 0.08 μV.
S-meter sensitivity: Not specified.	14 MHz, S9, preamp off, 94 μV; preamp on, 29 μV.
Audio output: 2.2 W into 8 Ω.	2.7 W at approx 10% THD into an 8-Ω load.

NOTE: Except as noted, all dynamic-range measurements were taken using the ARRL Lab standard spacing of 20 kHz.

*Measurement was noise-limited at value shown.

†Third-order intercept point was determined using S5 reference.

Digital Displays—The Good and the Bad

The front panel is attractive and stylish, but at a cost of a more comprehensive display of information. The AR7030 sports a green-backlighted LCD display that can fit up to 48 characters—numbers, letters, S meter bar graph and clock time—at any one time, so it's a bit limited in what it can show at any given time. The individual characters are a bit coarse (ie, not as bold) compared to similar displays on transceivers we've seen. The front panel has an effective viewing angle of at least 45° from head on, in any direction. In good lighting this angle increases.

You can program this receiver to do whatever you want, and it will memorize your favorite settings. However, if you forget your settings, you must step through a menu to find out what you set a short time ago, yesterday or last year.

Two buttons on the left-hand top corner of the radio—one with a light and dark dot and the other labeled **MENU**—select two banks of functions. You use the "double-dot" push button to shut off the receiver. The labels of three buttons in the second column under the display window are **FILTER, RF-IF** and **MEMORY**. In combination with the "General" button (labeled simply *) and a small rotary knob (which AOR calls a "spin-wheel"), all receiver functions are available from the front panel, assuming you follow the menu.

I found many functions to be more easily controlled by the remote control unit. Frequency, memory selection, recall and storage, mode and filter selection only require a few pushes of the remote control's buttons. In fact, direct frequency entry is possible *only* via the remote control box. Volume can be controlled either by a simple rotary knob on the receiver front panel or from the remote-control box (I happen to like rotary volume controls).

How easy is control through a menu system? Well, it's a bit like using some of today's more compact radios and H-Ts, where multifunction controls predominate. It's not always intuitive, but the manual is

pretty helpful. Sometimes I found it easy, but occasionally I got lost and had to start the entire process over. After a few hours of using the radio, many controls become second nature.

One thing that made the menu system a bit more confusing was the natural tendency to try to make adjustments based on the printed front-panel labels. That's because the menus can change a button's normal function—something that was not readily apparent, even from reading the manual. For example, it was not immediately obvious that you use the **RF-IF** and **MEMORY** buttons to turn on the receiver's built-in preamp or to kick in up to 40 dB of attenuation. The trick is to pay attention to the menu labels on the display window. These tell you what the buttons and controls are actually used for within a given menu.

Within the confines of this menu system, you can recall each setting, but not all of them at the same time. Often, it took many pushes and turns before I found my current settings, and then had to push the menu button one more time just to get back to using the receiver!

Fingers and Eyeballs

If you plan to spend a lot of time using a receiver, the feel of the controls and the clarity of the display are very important. Almost all receivers (and transceivers) these days are built too close to the table for my fingers, but a fold-down bail is mounted under the AR7030. Many users will find the bail very helpful to raise the controls to a more comfortable level and to angle the display for better viewing.

Since I found it easier to control many functions from the remote control unit, it was a strange feeling to take my hand off the front panel and pick up the remote unit. I'm not sure how quickly you can get used to switching between ham-knob and "VCR" modes of control. Maybe if you watch a lot of TV, you'll also feel at home with the AR7030.

AOR does allow for using the remote control box in an unconventional way. There is a sensor at both the front and the back of the receiver, and you can stand to the side, with the front panel shielded, and bounce the remote signal off the back wall of the operating area into the rear panel sensor!

Ins and Outs

The front panel has a 3.5-mm stereo audio jack, a very nice touch. Audio for the headphones and auxiliary output is provided in two channels, although the AR7030 does not provide stereo output. Since most inexpensive headphones these days are wired for stereo—to work with portable CD-players and tape decks—this means you will not need one of those pesky stereo-to-mono adapters to use an ordinary set of headphones.

The rear panel has a selection switch for either a 50-Ω antenna connection or a random-length wire. An RS-232 interface is supplied. AOR's *Data-Master* software for *Windows* and *Windows 95* is available as an option. There's also a contrast knob on the rear panel, although you probably won't need it. The display is a black-on-green LCD panel, but full contrast seemed to give the best readability.

How Does It Sound and How Does It Work?

It sounds good! The Lab measurements tell the story in numbers, but the audio was clean and full. SWLing was a pleasure, and the 3½-inch internal speaker was remarkably pleasant. The AR7030 lets you boost or cut the treble and bass to shape the audio for your listening taste. (When I plugged in the external speaker I usually use with my vintage ICOM receiver, it didn't sound nearly as good as the built-in speaker.) Sideband signals sounded crisp. I did not use it to listen during any contests, but the standard "tune 20 SSB on a Sunday morning" test was impressive. It worked fine for listening to the standard AM broadcast band, too—even at night (perhaps especially at night).

The AR7030's synchronous AM detection helps to minimize problems with selective fading. Not only that, you can pick individual sidebands on AM signals and even switch in different filters while in synchronous mode to help dodge interference. Qualitatively, there was a little less noise apparent on synchronous AM detection than on ordinary AM detection, but the audio quality was the same. Tuning was a snap. Just get close, press the button for **Snc** and the AR7030 will automatically tune in the signal. Turn the tuning dial to look elsewhere, and the radio will automatically swap over to conventional AM mode.

The radio is not as sensitive as most of the ham transceivers we've looked at lately, but engaging the preamp gives you about a 10-dB boost. If you're planning to encounter very strong signals, the AGC is a must. By the way, the radio offers four AGC settings—fast, medium, slow and off.

Our AR7030 had no noise blanker, but AOR has just come out with its optional NB7030 "enhanced multi-function audio notch and RF noise blanker" board. (The NB7030 includes a new microprocessor chip for the radio that also provides 400 memories and memory-naming, among other features.)

You can set the tuning step for changing the frequency using the remote control. Step tuning worked fine on the AM broadcast band (set to 10-kHz steps), but after pushing the button a few times, we noticed that the frequency on the display would be off by 10 Hz (ie, 1079.99 instead of 1080 kHz).

The AR7030 can scan between its two VFOs (which AOR calls dual-VFO operation), and you can set the minimum time that each VFO is monitored before it switches to the other VFO (from 0.5 to 30 seconds). You can also scan memories.

We did not purchase any optional filters for the AR7030, but the receiver can accommodate two additional IF filters in the 455 kHz IF. AOR says that, "within reason," any 455-kHz filter can be used, but the PC board is drilled to accept Murata filters and Collins mechanical filters.

These days we expect receivers to be stable. This receiver, which incorporates a temperature-compensating crystal oscillator (TCXO), claims stability of better than 1 part per million from 10° to 40° C. My test was very practical: when left in my basement shack for a few days, will the AR7030 continue to copy weather RTTY without being touched? I often leave a receiver on the maritime information FEC broadcast on 518 kHz (in addition to the 8 MHz weather broadcasts). This receiver was rock solid for more than three days—the only reason for the three-day limit was that I needed to recover the use of the computer for other tasks!

Operating Manual

No discussion of the AR7030 would be complete without a few words about the 37-page *Operating Manual*. It's thorough, and it's thoroughly British, complete with a little wry humor from time to time. For example, it suggests running through the filter calibration procedure if "you have just got bored with listening to your radio." At another point, it asserts that the main tuning dial "likes to be used...give it a few turns once in a while."

Charts early on in the *Operating Manual* reveal the mysteries of the menu structure. There's also a handy quick reference guide that covers the essentials of operating the AR7030. Another quick reference guide explains remote-control box basics. There's a block diagram and four pages of specifications (many more than the typical transceiver), but no schematic. The manual frequently includes sample display windows to guide you through the intricacies of operation. An index would have made the manual more useful.

Is This Receiver for You?

The minimal controls combined with the limited number of items on the display didn't appeal to me, but others who used the AR7030 had fewer problems with this arrangement. For many functions, using the remote control was much less awkward. It's all a matter of style, and we hams often feel more at home with lots of dials and buttons. If you're already acclimated to using a remote control "clicker" for your TV and VCR, the AR7030 will likely be a breeze to operate. Many discriminating listeners would find this a great set to have in their listening post or even in their den, and it's a superb performer.

Thanks to Rick Lindquist, N1RL; and

Mike Tracy, KC1SX, and Mike Gruber, W1DG, of the ARRL Lab, for their help in conducting this product review.

Manufacturer: AOR Manufacturing Ltd, 4E East Mill, Bridgefoot, Belper, Derbyshire DE56 2UA, UK; tel +44 1773 880788; fax +44 1773 880780; e-mail **info@aor.co.uk**; WWW **http://www.demon.co.uk/aor/**. Manufacturer's suggested retail price: $1400. NB7030 audio notch and RF noise blanker board, $315; SM7030 service kit, $90; FPU-7030 enhanced features CPU, $110.

Radio Shack Model 21-527 Digital SWR/Power Meter

Reviewed by Steve Ford, WB8IMY
Managing Editor

Someone once said that SWR meters are the inventions of the Devil because they cause so much suffering. There is a lot of truth in that statement. Many hams grieve needlessly over antenna systems that register "horrible" 1.8:1 SWRs. Their diabolical meters compel them to spend *hours* tweaking and re-tweaking in desperate attempts to reach Nirvana—the "perfect" 1:1 SWR. And for what?

But bedeviling aspects aside, SWR meters *do* serve useful purposes. Most modern transceivers won't tolerate more than a 2:1 SWR before they begin reducing output, so it pays to have some knowledge of your SWR conditions. In addition, your SWR meter often provides the first indication of trouble in your antenna system. If you leave it in the line at all times, you can watch for sudden variations that might signal a broken wire, a corroded connector, an arcing antenna tuner and so on. And if your SWR meter includes a wattmeter function, you can also use it to keep an eye on your radio's output level.

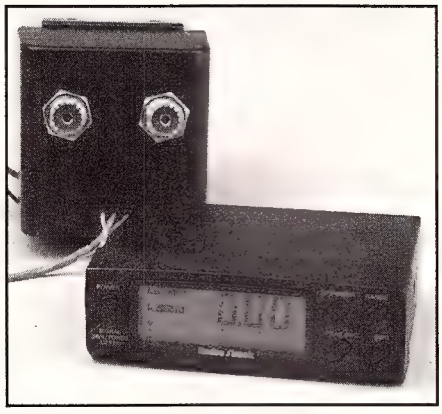
In recent years, the *digital* SWR meter has been encroaching on a market dominated by analog meters. Digital meters tend to be expensive, however, which limits their appeal. Radio Shack hopes to win the hearts of hams with a new approach—an *economical* model known as the model 21-527. Can they succeed?

Features

The 21-527 lets you measure SWR and power from 1.8 to 30 MHz in ranges from 1 W to 2 kW. You can select power ranges manually (a button on the display unit steps through the 20, 200, and 2000-W scales), or leave it to the meter's autoranging function. I preferred the convenience of autoranging.

The SWR readings appear on a compact, easy-to-read, backlighted LCD display. If the forward power input to the meter is less than 0.5 W, it cannot calculate the SWR and simply displays **Lo**. If the SWR is too high, it displays **InF**. You can also select a peak or average-power display (more on that later).

The 21-527 includes a remote sensor unit, which lets you sample the RF at one location and view the results at another. The sensor connects to the display unit via a four-foot-long, three-wire cable and a mini-stereo plug. (The manual states that you can use a cable of greater length, but it doesn't mention a *maximum* length.)



A 12-V dc power cube is included with the meter. For this review I simply used my station power supply. There are only so many ac outlets to go around!

On the Air

The 21-527 was installed in minutes. In my station, the only issue was finding a place to hide the remote sensor, which takes up a bit more space than the digital control box. The remote sensor has a mounting bracket. The control box has threaded holes in each side that appear to be designed to accommodate a mounting bracket, but none was supplied.

I subjected the meter to power levels from about 0.5 W to 600 W. Readings in the average power-setting—the power-up default—were confusing. Unless it was reading a steady carrier, the display flashed a bewildering cascade of digits that never seem to settle down. As a result, I used it in the peak mode at all times. Tests in the ARRL Lab indicated, however, that the meter was not really providing a true PEP reading, but something that was more than average power but less than PEP. To put it in perspective, however, the meter was about as accurate on PEP readings as many of the wattmeters we looked at in a comparative review of SWR/wattmeters a few years ago (see "Product Review," *QST*, Feb 1991). The auxiliary bar graph at the bottom of the display is a nice touch. It augments the digital readout by providing a relative indication of power or SWR—depending on the mode you've selected.

SWR readings were a snap. My only complaint—and this applies to many other digital SWR meters—was that the display was slow to adjust to abrupt changes. I use a venerable Johnson Matchbox antenna tuner with a dipole that's center fed with 450-Ω ladder line. With my analog meter it's easy to see the sharp SWR dips as I adjust the Matchbox. If you rely solely on the digital readout of the Radio Shack 21-527, it's possible to miss these tuning points because of the display's slow response. On the 21-527, however, you can use the auxiliary bar graph across the bottom of the display instead of the digital readout to see the SWR "dip." Of course, if you are using a resonant antenna system, or an automatic antenna tuner, this isn't an issue.

We spot-checked the accuracy of the wattmeter in the ARRL Lab, using it to measure power from 10 W to 1500 W on 80, 20 and 10 meters. For the most part, measurements made using the Model 21-527 were within 10% (in most cases, *well* within 10%). Things started to veer out a bit above power levels of 1000 W or so on 28 MHz, but the meter still was only approdimately 10% off at 1500 W. That's quite respectable for a meter that costs around $60.

BOTTOM LINE

An economically priced digital SWR/wattmeter with good accuracy and good looks. It includes a remote sensor, and it's entirely adequate for typical, non-critical ham use.

Conclusion

The Radio Shack 21-527 is a fine value if you want the convenience of a versatile digital SWR/power meter at a reasonable price. But you'll have to hurry to get one—Radio Shack is closing out this product. The ±10% full-scale accuracy is more than adequate for most amateur applications. It certainly would be suitable for mobile use. The ability of the 21-527 to provide readings from QRP to QRO power levels is a big plus not found on many HF SWR meters. The stylish 21-527 design and the remote sensor are icing on the cake.

A special thanks to ARRL Educational Programs Coordinator Glenn Swanson, KB1GW, for his contribution to this review.

Manufacturer: Tandy Corporation, 1900 One Tandy Center, Ft Worth, TX 76102; tel 817-390-3700. Manufacturer's suggested retail price, Model 21-527, $60.

Hints & Kinks

*Edited by **Bob Schetgen, KU7G** • Assistant Technical Editor*

BUILD A VACUUM-TUBE PRODUCT DETECTOR

◊ Here's a worthwhile and easy-to-build addition adaptable to any number of older classic receivers. If you've wanted to try building a tube project, this is it!

I wouldn't have paused for something like a Hallicrafters SX-101 receiver at a hamfest five or ten years ago, but lately I've noticed this old junk getting rather pricey. So, when I recently stumbled across one that seemed affordable, I had to have it.

The SX-101 is one of the receivers I wanted as a kid (instead of my Heath AR-3), and after I got this prize home, I started to remember why. The thing is big, and it looks very impressive—decked out in satin-silver, black and gray. Something with such good looks should certainly hear signals from the farthest corners of the universe.

Well, not quite! After a few minor repairs, however, it seems very stable, sensitive and selective—good enough to be usable, even on today's crowded bands. The only problem I noticed was the SSB audio: It sounded a bit ratty because this Mark III version of the SX-101 did not include a product detector. Many such receivers built in the late '50s only included a diode detector (best suited for AM reception) even though they had most other features of a good SSB receiver. This was definitely a shortcoming, and I had to do something about it.

The logic of my next move may elude some (including my spouse). I promptly went out and acquired a matching HT-32 transmitter. Well, the receiver was nice alone, but I could get on the air with the pair, and so I did. This prompted me to solve the no-product-detector problem.

Later versions of the SX-101 series receivers included a product detector circuit. I didn't want to trade up to a later model because this one covers 160 meters, which was unavailable in later versions. Hallicrafters used a fairly conventional circuit (see Figure 1) that appeared easily adaptable to my receiver, or for that matter, many other old receivers. Figure 2 shows the SX-101 with its case removed for the work.

While there is room on the SX-101 chassis to add a tube socket for the new circuit, I elected to build it in a small aluminum box instead. (See Figure 3.) This technique allowed me to add the product-detector circuit with *no* mechanical modifications—just a couple simple (and reversible) wiring changes. I secured the subassembly to the SX-101 chassis using double-stick tape as shown in Figure 4.

Building the Detector Circuit

The detector circuit uses few components. A seven-pin tube socket may be the most difficult component to procure. Antique Electronics Supply stocks them, should you have difficulty obtaining one from a local source.[1] All other components, including the box, are available at Radio Shack stores.

I used mostly salvaged components in my version of the product detector, including a used box. As shown in Figure 3, I used mica capacitors because I happened to have them, but disc ceramics will work just as well. In keeping with the practice of the era, I used 1/2-W carbon-composition resistors throughout. (You could probably use 1/4-W resistors, but a couple of calculations showed this rating to be a bit marginal.) I had a surplus of 1/2-W resistors anyway.

I built my circuit using point-to-point wiring, keeping it neat and similar to the Hallicrafters style. To facilitate this, I used a couple of tie strips to support the components and as connect points for the interconnect cables. It's getting difficult to find old style tie points, but Radio Shack stocks a five-lug tie point (no. 274-688) that looks very similar to the old style.

The receiver leads are approximately eight inches long. I used shielded cables (similar to RG-174) for the IF, BFO and audio leads. As this is a high-impedance vacuum-tube system, I tied the cable shields to chassis ground at each end. The power leads (B+, 6.3 V ac filament and ground) are ordinary hook-up wire.

Installation

The product-detector module mounts on the SX-101 chassis in a location where there was sufficient space, near the receiver's BFO, IF and audio tubes. As previously mentioned, double-stick tape secures the box. Radio Shack no. 64-2361 holds very well, yet can be removed should that need ever arise. (A little alcohol easily removes

[1] Antique Electronic Supply, 6221 S Maple Ave, Tempe, AZ 85283; tel 602-820-5411, fax 602-820-4643 or 800-706-6789.

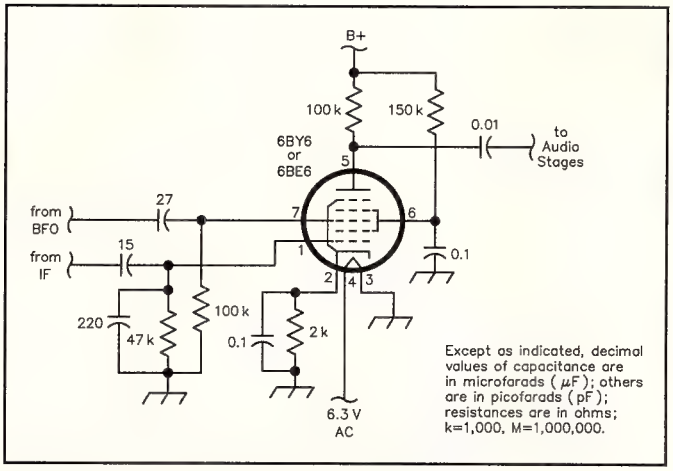


Figure 1—A vintage vacuum-tube product detector circuit. Use 1/2 W, 5% tolerance resistors. Capacitors are not critical; 500 V ceramic-discs are fine.

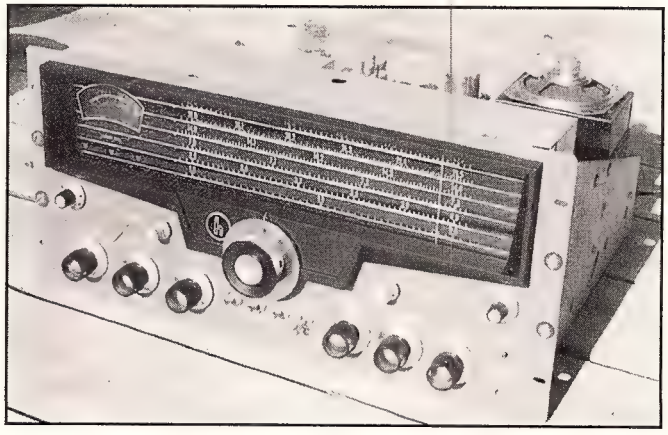


Figure 2—The SX-101 receiver out of its case, ready for "surgery."

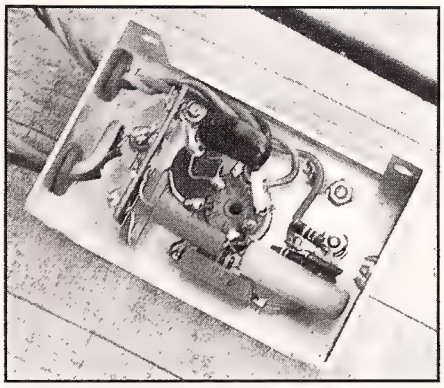


Figure 3—Under-chassis view of the completed product-detector module.

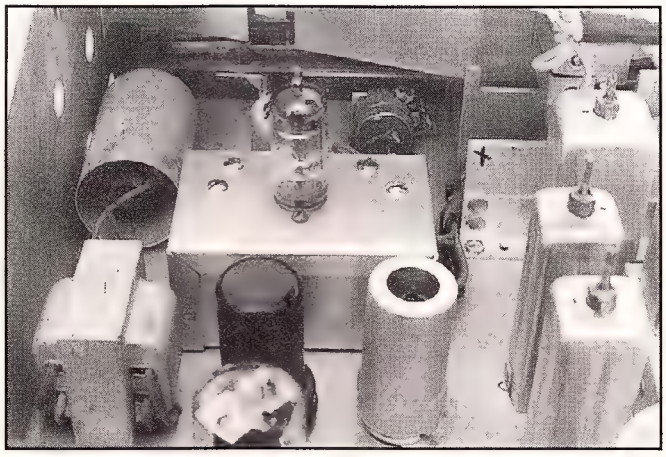


Figure 4—The product-detector subassembly sits atop the SX-101 chassis. Double-stick tape holds it in place.

any adhesive residue.) I routed the interconnecting cables from the module through an existing chassis opening near the main-tuning bracket to existing tie strips under the SX-101's chassis.

A few receiver circuit modifications are necessary to get the new detector operational. First, disconnect the BFO output at the receiver's diode detector. I was able to unsolder the existing coupling capacitor and tie it to an unused terminal lug in my receiver to keep it out of the way. Next, connect the product detector's BFO-input lead to the receiver's BFO output. The 27 pF coupling capacitor's reactance (see Figure 1) is quite close to that of the receiver's diode load, which made adjustment of the BFO frequency unnecessary. This may not be so if you're adapting this circuit to some other receiver. I tied directly to the plate circuit of the SX-101's BFO tube (pin 2 of the 6SC7).

The IF connection comes next. I tied directly to the diode plate (pin 2 of the 6BJ7) and found this additional loading insignificant. With some other receivers, this may require that you retune the last IF stage.

Disconnect the original diode detector's audio output (usually at the hot end of the volume control). I wanted to retain diode detection for AM reception (it works a bit better than a product detector on AM), so I wired the receiver's audio input to the center lug of an SPDT switch. Then the product detector's audio output connects to one of this switch's end lugs, and the diode's audio to the other. I removed the receiver's **LIMITER** switch, mounted the new switch in its place, then connected the two wires from the old limiter switch (limiter off), taped them and tucked them out of the way.

This capability cost me the use of the limiter, but I never used it anyway. If you want to retain the limiter function, use some other switching method, or simply wire the product detector to the audio stages for use all the time. Its performance on AM is okay, but the audio recovery of a diode is better.

Finally, I connected to the receiver's B+ (150 V, regulated), 6.3 V ac filament power, and ground at convenient tap points in the SX-101's wiring. Be careful when connecting to the receiver's filament circuit; don't accidentally short this line. Check the filament circuit with an ohmmeter before and after you make the connection. An error here endangers the filament wiring, and you could wreck the receiver's power transformer as well.

Checkout and Operation

This is a simple, straightforward circuit that requires no adjustments. Simply verify that the wiring is correct. After switching the power on, make sure the new tube lights and the receiver's voltage-regulator tube stays ignited (indicating that there are no B+ shorts). If these checks are okay, switch in the new detector (if you're using a switch), turn on the BFO and tune in an SSB signal.

You'll notice better AVC action; strong signals should no longer sound garbled. Expect received SSB audio as good as you've heard on any receiver.

Adapting this Circuit to other Receivers

I've used this circuit successfully with several receivers including a Collins 75A2, 51J3, various older Nationals, and my Hammarlund HQ-140X. To adapt this circuit, locate and connect to the target receiver's BFO, IF and audio stages with methods similar to those described for the SX-101. In virtually all cases, the results will be well worth the effort. Who knows, maybe you'll be out buying a transmitter to accompany your new classic receiver. *— L. VanProoyen, K8KWD, 8330 Myers Lake NE, Rockford, MI 49341*

EXTENSION HANDLES AS LIGHTWEIGHT ANTENNA SUPPORTS

◊ Do you need a portable antenna support for Field Day, emergencies or public-event operations? Paint stores sell lightweight extension handles for paint rollers and pads. The best one I found in Dayton has two-sections made of fiberglass. It extends from 8 to 16 feet and easily supports a 2 meter ground plane or beam. The cost was $31. *—E. P. Rolek, K9SQG, 2053 Mohave Dr, Dayton, OH 45431*

A SOURCE FOR HIGH-CURRENT RELAYS

◊ Wal Mart's sporting goods and RV department has high-current relays, switches, fuse holders and so on that handle 100 A. These components are useful for battery-powered rigs, Field Day and such.*—E. P. Rolek, K9SQG, 2053 Mohave Dr, Dayton, OH 45431*

EYEGLASS CASES PROTECT REMOVABLE FRONT PANELS OF MOBILE RADIOS

◊ Here's a quick, easy way to protect detachable faceplates of mobile rigs when they are removed from the radio or mount.

I was showing my spouse how neat it is to have my radio installed in one place and the control head mounted in another. When I demonstrated how you can take the control head with you to deter theft while you're away from the vehicle, she suggested that I put the detached faceplate in an eyeglass case for protection. Such cases are readily available and made to protect their contents from scratches. I don't know if all models will fit, but my Kenwood TM-733A faceplate fits nicely.*—Tim Seeley, KK7EF, 601 S, 400 E, Kaysville, UT 84037*

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QST invites you to share your hints with fellow hams. Send them to "Attn: Hints and Kinks" at ARRL Headquarters (see page 10), or via e-mail to **rschetgen@arrl.org**. Please include your name, call sign, complete mailing address, daytime telephone number and e-mail address on all correspondence. Whether praising or criticizing an item, please send the author(s) a copy of your comments. QST

Technical Correspondence

Edited by ***Paul Pagel, N1FB*** • *Associate Technical Editor*

RF CHOKES CHOKE TOUCH-LAMP RFI

By Rod Davis, KM6SN, 13348 Olive Tree Ln, Poway, CA 92064, e-mail **km6sn@beacons.cts.com.**

◊ I was having an RFI problem with two of my neighbor's touch-controlled lamps, especially on 80 and 40 meters. I recalled seeing some touch-lamp RFI-curing tips in earlier installments of Technical Correspondence[1, 2] and went looking for them. Both were of help, but the May 1993 article by Dave Hallock, WØSS, was most informative.

After receiving permission from my neighbor, I opened the lamps. In the first one, I found a black plastic snap-together box containing a controller board. The board did not correspond exactly to the one identified by Hallock, but it had similarities. The yellow wire that attaches to the touch lamp's metal frame connected to a pair of 0.002 µF disc ceramic capacitors, then fed the detector circuit through a 1 kΩ resistor. I realized that (1) this was different than Hallock's circuit, and (2) there was no room inside the black plastic box for one of the older, 2.5 mH pie-wound RF chokes I had on hand.

So, I simply cut the yellow wire between the exposed metal lamp frame and the controller board, inserted the 2.5 mH choke in series with the two wire halves, and used a liberal amount of insulating tape to cover the choke and attachment points.

That cured the RFI *completely!*

Lamp number 2 was made by a different vendor, but it also had a yellow wire attached to the external metal lamp frame. Without bothering to investigate the circuit, I proceeded as I'd done earlier: I cut the yellow wire and placed a 2.5 mH choke in series with the wire. It, too, completely cured the RFI to the lamp. Thanks for your help!

CHECKING ANTENNA LAYOUTS

By Guy Black, W4PSJ, 315 Woodside Ln, Winchester, VA 22603

◊ Wire antennas for the HF bands—commonly supported at the ends (or in the middle as an inverted **V**)—often must pass over houses or other obstructions. You, the antenna erector, must have some way to ensure the available support points are far enough apart for the antenna in mind. Such obstacles make it impossible for you to *directly* measure the distance between intended supports. What do you do?

Use trigonometry! For instance, my house lies between two trees that might support an 80 meter dipole, with the major radiation pattern lobes in the direction desired. As shown in Figure 1, my solution was to find a location nearby where both support points were visible. From that location, I measured the distances to the proposed support point and the angle between the bearings to each of them. Sometimes it is convenient to stretch nylon fishing line between the proposed support points and the common point, which makes it easy to find the bearing angle with a common protractor. Alternatively, rough sighting devices can be made by securing a nail to each end of a strip of wood. The wood strip rotates around a central point that is also the center of a rotatable protractor. Of course, any available professional instruments shouldn't be scorned!

The straight-line distance between the two support points can be calculated using the trigonometric law of cosines, which covers the case of two sides, A and B, and an included angle (θ), yielding the formula for the unknown side, C, opposite the angle:

$$C = \sqrt{A^2 + B^2 - 2AB\cos\theta} \qquad \text{(Eq 1)}$$

Suppose the situation is that of Figure 1 where A is 55 feet, B is 90 feet and the angle between the two bearings is 110°. Using the square root and trigonometric functions found in all but the simplest calculators: $A^2 = 3025$; $B^2 = 8100$; $2AB\cos\theta = 2\times55\times90\times\cos110° = -3385.8$.

Because the angle exceeds 90°, the cosine term has a negative sign, but because there is already a negative sign in the formula, the three terms are added together before the square root is taken. (If the angle is less than 90°, the third term is subtracted before the square root is taken). In this example, the distance between the trees is 120.5 feet, a bit short for a 132-foot 80 meter dipole.

A similar approach can be used to find the horizontal span of half an inverted **V** or sloper. Having found the horizontal span—and knowing the vertical distance between the top and bottom ends of the wire—the space available for the antenna legs can be found with a little help from Pythagoras: the square root of the sum of vertical and horizontal distances, each squared.

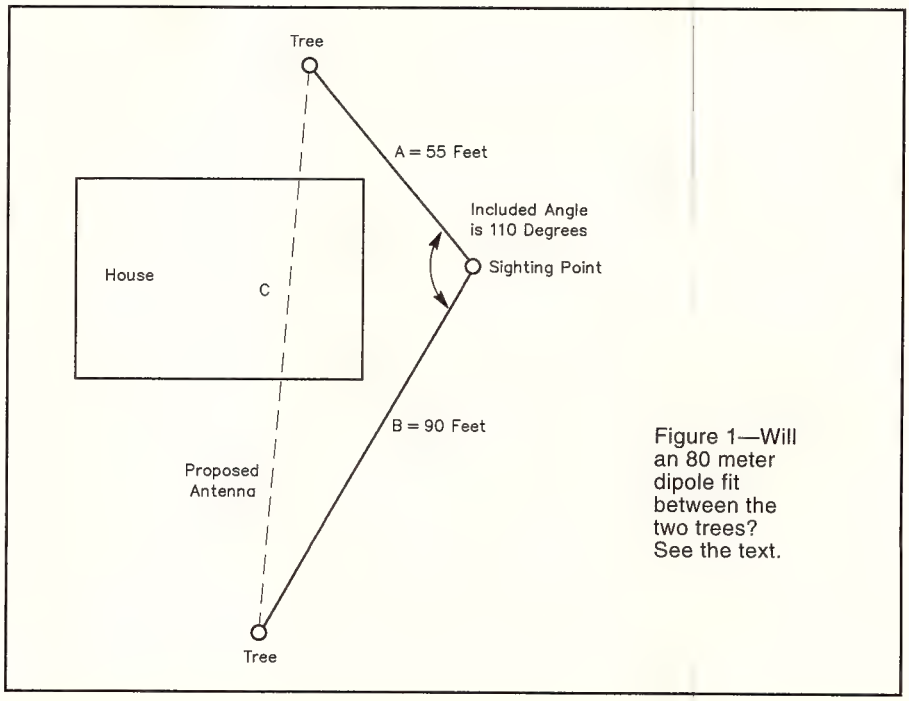


Figure 1—Will an 80 meter dipole fit between the two trees? See the text.

[1]Dave Hallock, WØSS, "Touch Lamp RFI Cured," Technical Correspondence, *QST*, May 1993, p 78.
[2]James B. Wiley, KL7CC, "Touch-Controlled-Lamp RFI," Technical Correspondence, *QST*, Jan 1993, pp 53-54.

YEAR 2000 PROBLEM

By Charlie Sudranski, W2XY, 1417 41 St, Brooklyn, NY 11218-3511

◊ The Doctor's explanation of the Year 2000 Problem[3] is a good one, but not quite complete. Here's what happens with my '386 running MS-DOS 6.2, and presumably, with many other PCs.

When the date increments from 12-31-1999 to 01-01-2000, both clocks—the system clock and the real-time (RT) clock—are affected. The system clock shows the correct date, but the RT clock reverts to 1900. Then, when the computer is rebooted, the system clock grabs the incorrect date from the RT clock and interprets it as 1980. This is the problem as described by the Doctor.

If, however, I enter a new date of 01-01-2000 (*not* 01-01-00!), this *does* get to the RT clock. Now I reboot, the system clock initializes correctly, and the date remains correct. The problem is gone for—well, the next 100 years. In other words, even though the RT clock can't roll over into the next century, it can be set to the next century by the DOS DATE command.

Don't buy some expensive fix if all you need to do is what you would have done if you'd never heard of the Year 2000 Problem: One day you notice a wrong date. You wonder how that happened. You type in the correct date (mm-dd-yyyy format) and all's well.

Of course, if you have a *software application* that's written to recognize only two digits for the year, that could be a problem.

[3]"The Doctor is IN," *QST*, Mar 1997, pp 46-47.

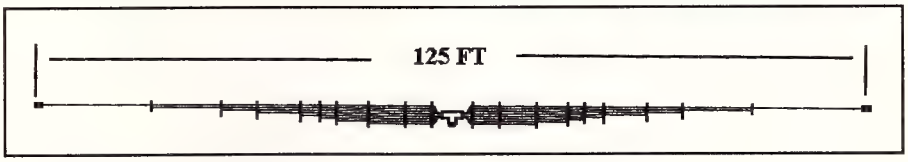
Letters for this column may be sent to Technical Correspondence, ARRL, 225 Main St, Newington, CT 06111, or via e-mail to **ppagel@arrl.org.** Please include your name, call sign, complete mailing address, daytime telephone number and e-mail address on all correspondence. Whether praising or criticizing a work, please send the author(s) a copy of your comments. The publishers of *QST* assume no responsibility for statements made herein by correspondents. QST

New Products

MULTIBAND HF/VHF ANTENNAS FROM DYNAMIC ELECTRONICS

◊ Using eight dipole elements and no traps, the DP-1 from Dynamic Electronics covers every amateur band from 80 through 2 meters. The 125-foot-long, wide-bandwidth antenna is best erected as an inverted **V**. It's made from PVC spacers and insulated 14-gauge wire, can handle the legal power limit on every band and has a handy SO-239 connector at the feed point.

Prices: DP-1, $129 plus $6 shipping and handling. For more information, contact Dynamic Electronics at PO Box 896, Hartselle, AL 35640; tel 205-773-2758, fax 205-773-7295, WWW **http://www.hsv.tis.net/~dei.**



DP-1 from Dynamic Electronics

NEW LADDER LINE PRODUCTS FROM CABLE X-PERTS

◊ Two new ladder line offerings comprise the latest additions to the comprehensive Cable X-perts product line-up. Cable X-perts' new 300-Ω ladder line starts at 13 cents per foot, with discounts for quantities of 500 and 1000 feet. The new 450-Ω ladder line features 14-gauge conductors and is rated for higher power. Prices for the heavier line start at 25 cents per foot, with similar quantity discounts.

The company also stocks a lighter-duty 18-gauge 450-Ω ladder line and Ladder-Loc center feed insulators. For more information, contact Cable X-perts at 416 Diens Dr, Wheeling IL 60090; tel 800-828-3340. e-mail **cxp@netcom.com**.

POLICE CALL PLUS NOW AVAILABLE ON CD-ROM

◊ The popular *Police Call Plus* frequency reference for scanner enthusiasts is now available on CD-ROM. *PCP*, suitable for beginning and experienced hobbyists, features a powerful search engine that tracks and sorts all domestic public-safety radio licensees in the following categories: state, licensee name, city, service code, frequency, call sign and system type.

A *Windows* 3.x or *Windows 95* system with at least 8 MB of RAM is required. Price: $29.99. For more information, see your local Amateur Radio dealer or contact Hollins Radio Data at PO Box 35002, Los Angeles, CA 90035; tel 310-202-1418, e-mail **Hollinsrad@aol.com**

NEW ANTENNA MART CATALOG

◊ Loganville, Georgia's, Antenna Mart Quads has just released its newest catalog. Detailed are more than a dozen new items, including new quads for 50 through 440 MHz; RF switches; 40 and 80-meter vertical arrays and linear-loaded, shortened quads for 40 and 80 meters and more. To get your copy, send $2 ($4 overseas) to Antenna Mart Quads, PO Box 699, Loganville, GA 30249; tel 770-466-4353, fax 770-466-3095. To offset the cost of the catalog, you'll receive a $5 credit on your first order.

PASOKON'S *TV LITE* SSTV SOFTWARE

◊ Designed to work with a wide variety of popular SSTV interfaces (including two you can easily build yourself), *TV Lite* is an easy-to-use SSTV system. It uses a simple menu system and has automatic calibration and context-sensitive on-line help. *TV Lite* supports dozens of domestic and international SSTV modes, SVGA screen resolutions to 16 million colors and handles more than seven graphics file formats with its built-in editor.

Other features: tuning indicator; automatic fine tuning; image processing; excellent image quality; and more. Computer requirements: 486-class IBM-compatible system (or better); 8 MB RAM; color VGA display; and a free serial port. For complete specs, pricing and more information, contact Absolute Value Systems at 115 Stedman St, Chelmsford, MA 01824; tel 508-250-0611.

1997 AM RADIO LOG FROM THE NATIONAL RADIO CLUB

◊ Now in its 17th edition, the 312-page NRC *AM Radio Log* has information on more than 5500 AM broadcast stations in the US and Canada. Relied on by BCB DXers for years, the *Log* is in loose-leaf format (punched for a standard three-ring binder) and organizes each listing by location, frequency, call sign, format, network affiliation, address, slogan and transmitter power (cross references by city and call sign are also included).

Price: $22.95 (US and Canada); $23.50 (Latin America); $24 (Europe); and $28 (elsewhere). Please mail prepaid orders to National Radio Club, Publications Center, PO Box 164, Mannsville, NY 13661; tel 315-387-3583. QST

Happenings

*Edited by **Rick Lindquist, N1RL** • Senior Assistant Technical Editor*

ARRL Calls on FCC to Privatize Handling of Malicious Interference Complaints

Citing "a substantial need to improve and increase the quantity and quality" and timeliness of enforcement in malicious interference complaints, the ARRL has called on the FCC to "create a streamlined, privatized enforcement process" to handle and adjudicate the most serious Amateur Service rules violations. In a petition for rulemaking filed March 28, the League asked that the FCC change its rules to permit members of the volunteer Amateur Auxiliary to bring evidence of malicious interference violations directly before the Chief Administrative Law Judge. The Chief ALJ would be authorized to determine if the complainants have a valid case, to issue show-cause orders, and to designate complaints for hearing.

The League recommended that the FCC capitalize on the volunteer resources available through the Amateur Auxiliary to relieve the evidence-gathering burden in such cases. If the rules changes are approved, the League said it would likely assist members of the Amateur Auxiliary in preparing and submitting complaints and in presenting cases at administrative hearings. "The increased use of volunteer resources would seem to be entirely appropriate in the Amateur Service, which involves avocational use of radio only," the ARRL concluded.

While noting that most hams obey the rules, the League said Amateur Radio needs the Commission's help "in a very few, persistent, serious enforcement cases" but has not been getting it in recent years because of the FCC's staff and budgetary limitations.

"Indeed, notwithstanding the best efforts of the Commission over the past several years, there has been no resolution of the four or five most serious cases brought to the Commission's attention," the League said in its petition. Even in some of the cases the FCC did act on, the League said the Commission did not go far enough to make the problems go away permanently. The League cited a case in New Orleans where fines against several amateurs were reduced but remain unpaid and uncollected. "There is a widespread, and growing, perception that administrative forfeitures are not collectable," the ARRL said, pointing to the complex, time-consuming method of collecting fines that is required by federal law. The ARRL noted that while the FCC suspended one ham's license in that city in 1996, it failed to look into malicious interference charges against at least two other hams in that area. The League said examples like these send a message that the FCC won't enforce Amateur Service rules in malicious interference cases. "Malicious interference problems, if left unchecked, tend to spread and increase in intensity," the League said. The ARRL suggested that a series of "visible, successful enforcement actions" would deter rules violations and promote self-regulation.

While noting that malicious interference cases often attract a lot of attention within the amateur community, the League said ham radio can be "justifiably proud" of its history of voluntary rule compliance. "The overall level of compliant behavior among amateurs *has not deteriorated over the years*," the League emphasized, citing fewer than 10 active malicious interference cases in the US at present.

FCC ISSUES CHANGES IN AMATEUR RADIO RULES

In response to three petitions for rulemaking, the FCC has adopted changes to the Amateur Service rules that—among other changes—will make it easier to obtain 1×1 call signs for special event stations and harder to get a club station license. Other amendments to the rules, included in a Report and Order released April 1, 1997, will allow hams to append special designators either before or after their call signs—or both, and will recognize, but not require, the use of a session manager at volunteer examiner testing sessions.

Citing mostly negative comments, the FCC decided against allowing exam credit for formerly held amateur operator licenses. The Commission also said "no" to the ARRL's suggestion that the operator license be valid for the lifetime of the holder. The changes became effective May

ARRL Ham-in-a-Weekend Class a Success

An intensive weekend Amateur Radio licensing class at ARRL Headquarters in mid-April attracted prospective hams from as far away as Kansas, Texas and Arkansas. By the time it was over, all 20 ham radio newcomers had passed their Technician exams and one Novice had upgraded to Tech Plus, and the group still had time left to assemble for this class photo at W1AW! Overseeing the condensed training program was Ed Hammond, WN1I (left, above), an author and lecturer who's been a ham for 25 years. At the end of the sessions—which started on a Friday evening and continued through Sunday afternoon—all of the students took and passed their Technician exams, administered by a group of local volunteer examiners.

In addition to the material required to earn a license, Hammond covered such topics as proper repeater and amateur operating procedures, and demonstrated ham radio equipment.

12, 1997. For more details about these changes, see "Washington Mailbox" on page 99 of this issue.

FCC PROPOSES, ARRL OPPOSES VANITY LICENSE FEE HIKE

The FCC has proposed effectively raising the fee for a vanity call sign from $30 to $50 for the 10-year license term, but the ARRL has asked the Commission to postpone the higher fee until after all four vanity call sign gates have been opened. In comments filed April 23, the ARRL told the FCC that it does not object to the fee increase *per se* but said that it wants all hams to have an opportunity to request a specific call sign under the current fee schedule.

The fee increase was among those included for all FCC-regulated services—including broadcasters and commercial satellite services—in the NPRM in MD Docket No. 96-186. Under the proposal, the FCC "rounded up" all FCC-imposed $3 annual fees to $5 per year—the lowest fee in the new schedule. The ARRL noted in its comments to the Commission that because projected revenue from the vanity fee increase "significantly exceeds" the revenue needed to cover the costs of administering the program, a delay would be reasonable. The ARRL also asked the FCC to limit the vanity call sign fee to the minimum it needs to recoup its costs to administer the vanity program but "without rounding to a significantly higher fee."

Fee adjustments are an annual exercise for the FCC, which says it must calculate its fees to "recover the amount of regulatory fees that Congress has required it to collect in FY 1997." The FCC said the regulatory fees will recover the costs of enforcement, policy and rulemaking, international and user information activities for FY 1997, which began last October 1. The FCC said it anticipated 10,000 applications for vanity call signs in FY 1997.

STS-83 REFLY IS A "GO" FOR JULY WITH SAREX ON BOARD

When the space shuttle *Columbia* prematurely came back to Earth on April 8, so did the soaring hopes of students and teachers at 18 schools that had been scheduled to talk with the astronauts via Amateur Radio as part of the Shuttle Amateur Radio EXperiment, or SAREX. In late April, however, word came from NASA that the shuttle mission will be reflown in July with SAREX aboard! The new mission will be dubbed STS-94. Three hams were on STS-83: Jim Halsell, KC5RNI, the mission commander; Janice Voss, KC5BTK; and Donald Thomas, KC5FVF. The same crew likely will be tapped for STS-94, set to launch on July 1 on a 16-day mission.

The *Columbia*'s April flight was cut short because of a fuel cell problem aboard the spacecraft before any of the scheduled QSOs with schools in the US, the People's Republic of China, and Japan could take place. To help assuage some of the disappointment, NASA Payload Specialist Ron Parise, WA4SIR, took time out from his work schedule at Goddard Space Flight Center the day before STS-83 returned to Earth to speak with some 300 thrilled students at the County College of Morris in New Jersey—one of the schools on the STS-83 SAREX schedule. Sixteen schools want to arrange new schedules for the July mission, which will again carry the microgravity science laboratory.

Despite the curtailed April flight, at least one of the hams aboard STS-83 managed a few spare moments to turn on the ham gear aboard the shuttle. Al Lark, KD4SFF, of Greenville, South Carolina, was able to chat with KC5FVF on Saturday, April 5. Rusty Hack, NM1K, in Enfield, Connecticut, also reported hearing KC5FVF aboard the shuttle on the same day, apparently a few minutes after the QSO with KD4SFF. QSOs on April 5 also were reported by KA3HPQ and N1JEZ during the same pass.

In the meantime, several QSOs of a scheduled round of ten MIREX school contacts took place during February, March and April with ham-astronaut Jerry Linenger, KC5HBR, aboard the Russian *Mir* space station. On April 14, Linenger took a few minutes to share some pleasant thoughts with pupils at Alaiedon Elementary School in Mason, Michigan. US Rep Debbie Stabenow (D-MI), a member of the House Science and Technology Committee, was among those on hand for the contact. The school enjoyed a lot of live media attention, as two TV stations and a daily newspaper showed up to cover the event. Students at Holy Angels School in Dayton, Ohio, got a chance to chat with Linenger April 21. The ground station, W8DOZ, was running 35 W into a turnstile antenna. On April 23, students at Jerling Junior High School in Orland Park, Illinois—a Chicago suburb—had a 10-minute contact with Linenger. More than a dozen students got to speak directly to Linenger as an audience of 800 students and 200 visitors looked on. Nearly 2500 students in other schools also got to listen in.

During earlier MIREX QSOs in February and March, Linenger assured students

"MR VHF," EDWARD P. TILTON, W1HDQ, SK

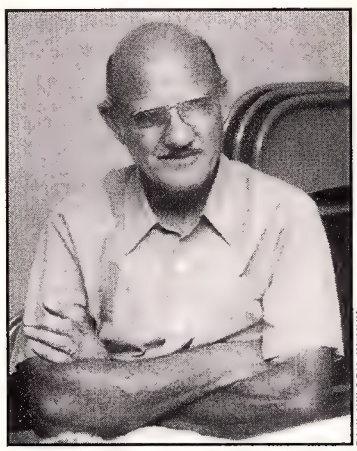
VHF pioneer and former *QST* VHF Editor Ed Tilton, W1HDQ, of Spring Hill, Florida, died March 1. He was 89. Licensed in 1933, Tilton became "Mr. VHF" to a generation or more of VHF and UHF enthusiasts. In December 1939, he inaugurated the first *QST* column devoted to VHF. Originally called "On the Ultra Highs," it eventually became "The World Above 50 MHz." Tilton edited the VHF column until 1960, reporting on-the-air activity and encouraging experimentation initially on the then-current 56 and 112-MHz amateur allocations, and later on all VHF and UHF bands. The UHF DX Records box—the precursor of today's standings boxes—debuted in 1940. During World War II, Tilton worked as a field engineer for the military on radar projects—mostly at Pearl Harbor and Guam—and became acquainted with the great technological progress the military was making in the VHF-UHF spectrum. Even while occupied with his military duties, he still managed to file occasional columns throughout the war years.

In 1947, Tilton established the first WAS standings box for 6 meters. In 1955, he proposed establishing the first calling frequencies for the 6 and 2-meter bands.

Following his retirement from full-time employment at ARRL HQ in September 1972, Tilton became a *QST* Contributing Editor. He was the author of *The Radio Amateur's VHF Manual* and wrote numerous articles for *QST*.

Tilton's column sparked growth within the VHF and UHF community and encouraged such activities as EME, meteor scatter and auroral propagation. Tilton himself held 50-MHz WAS No. 9 and was at the US end of the first transatlantic VHF QSO in 1946. He was considered an authority on sunspots and solar flares and their effects on propagation. As ARRL Executive Vice President David Sumner, K1ZZ, put it: "Ed Tilton was one of the outstanding amateur scientists of his generation. Perhaps more than any other individual, he led the exploration of the extended-range properties of the VHF and UHF bands."

Tilton was a life member of the ARRL. He also belonged to the QCWA and the Spring Hill Amateur Radio Club. He was a native of Springfield, Massachusetts. His wife, Leitha, died in 1995. His sister, Ruby, is among the survivors. Donations in Ed Tilton's name may be made to the Hospice of the Florida Suncoast, 300 E Bay Dr, Largo, FL 34640.



PAUL WILSON, W4HHK

Ed Tilton, in a photograph taken in the mid-1970s.

at two Texas schools that all aboard the space station were in good shape after a late February fire aboard *Mir*. which also has suffered from problems with its oxygen-generating and carbon dioxide scrubber systems, as well as from cooling system leaks. The shuttle *Atlantis* was scheduled to retrieve Linenger in mid-May and deliver astronaut Mike Foale, KB5UAC. Foale is scheduled to be replaced in September by astronaut Wendy Lawrence, KC5KII. The last US astronaut scheduled for a tour of duty on the *Mir* is David Wolf, KC5VPF, in early 1998.

INDEX LABS' BRUCE FRANKLIN AND SGC COLLABORATE ON NEW TRANSCEIVER

A collaboration between Index Laboratories president Bruce Franklin and SGC (of Bellevue, Washington) is expected to result in a new transceiver roughly based on the now-discontinued Index QRP Plus. The new transceiver will have a new name, several improvements and a smaller package. According to Franklin, SGC has contracted with him, personally, for engineering design services to develop the new transceiver, to be called the SGC 2020. It's scheduled to debut later this year.

Franklin made it clear that SGC has not acquired Index, its product line or its customer-service obligations. He said Index, located in Gig Harbor, Washington, will continue to provide warranty service for the QRP Plus transceiver, which Index no longer manufactures. Index also no longer provides retrofit service to upgrade QRP Plus transceivers to New QRP Plus transceivers.

Franklin said the new SGC 2020 will retain "the basic architecture" of the QRP Plus, but with some significant differences. Plans call for the new transceiver to have up to 20 W output (continuously adjustable down to 20 mW). The unit is expected to weigh just 1½ lb and will carry an introductory price tag of $595—$100 less than the QRP Plus sold for.

SGC anticipates that the SGC 2020 will be available around September 1, 1997. SGC Sales Director Robert Gregg said that the latest details and updates regarding the SG-2020 transceiver are posted regularly at **http://www.sgcworld.com**.

RADIO SHACK TAKES HTX-204 DUAL-BAND H-T OFF THE MARKET

Radio Shack notified its stores April 17 that it was immediately recalling unsold stocks of its new HTX-204 dual-band handheld transceiver because of what a source at Radio Shack headquarters called "a regulatory compliance issue" involving the transceiver. Radio Shack said it planned to take the HTX-204 off the market and had no immediate plans to offer another dual-band H-T. The HTX-204 started showing up in the chain's 7000 retail stores in early March.

A Radio Shack official at the company's Ft Worth, Texas, headquarters said the company was concerned about the "potential for illegal use" of the HTX-204. He declined to be specific, but he did emphasize that the HTX-204 is perfectly legal for use on Amateur Radio frequencies. Radio Shack expressed disappointment with the turn of events surrounding the HTX-204 and directed any questions to local Radio Shack retail stores.

NJ JUDGE RULES HAM INTERFERENCE OUT OF HIS HANDS

A New Jersey Superior Court judge has ruled that federal law prevents him from declaring ham radio interference a nuisance. Judge Reginald Stanton made that determination in a case reported April 16 in the *New Jersey Star Ledger*, in which a couple sued their neighbor, Walter Kornienko, K2WK, of Lafayette, New Jersey, claiming his transmissions interfered with their telephone, TV, and garage door opener. The couple, Leopold and Karen Korins, was trying to get Stanton to declare the situation a nuisance and to direct Kornienko—an avid contester—to cut back on his hobby. But Kornienko's lawyer claimed his client had a right to operate under a federal license and suggested the Korins do more to shield their appliances from RFI. According to the news report, Kornienko, who's been licensed since 1967, ran the maximum 1500 W PEP.

"There is no question that there has been meaningful intrusion into the Korins' home and their expectations of enjoying a reliable and reasonably high quality level of telephone and television reception," Stanton is quoted as saying in the *Star Ledger* report by Bill Riley.

Stanton conceded, however, that the FCC had jurisdiction and he had no authority to limit Kornienko's hamming. "If he is obeying the FCC rules and the Korins can't fix the situation in their home, that's tough and they'll have to lump it," Stanton reportedly said.

Kornienko is said to have expressed relief at the ruling.

1997 ARRL/TAPR CONFAB SET

Mark your calendar and plan to attend the year's premier event in Amateur Radio digital communication, the 1997 ARRL and TAPR Digital Communications Conference October 10-12, 1997, in Baltimore, Maryland. 1997 marks the second year in which the ARRL Digital Communications Conference and TAPR Annual General Meeting have joined into one conference. The 1997 DCC will be co-hosted by AMRAD (Amateur Radio Research and Development Corporation).

The ARRL and TAPR Digital Communications Conference is an international forum for radio amateurs and experts in digital communications, networking, and related technologies to meet, publish their work, and present new ideas and techniques for discussion. Presenters and attendees will have the opportunity to exchange ideas and learn about recent hardware and software advances, theories, experimental results, and practical applications.

Anyone interested in digital communications is invited to submit a paper for publication in the Conference Proceedings. Presentation at the conference is not required for publication. Papers are due by August 20, 1997. Submit papers to Maty Weinberg, ARRL, 225 Main St, Newington, CT 06111; **lweinberg@arrl.org**. Paper submission guidelines are available on line at **http://www.tapr.org/dcc**. ARRL and TAPR especially welcome papers from full-time students to compete for the second annual student papers award. Two $500 travel awards may be given, one for the best technical/theory-oriented paper by a student, and one for the best educational or community-oriented application paper by a student. The paper should relate directly to a wireless digital communication topic (see guidelines for more information). Papers co-authored

FCC SEQUENTIAL CALL SIGN UPDATE

The following is a list of FCC sequentially assigned call signs issued as of April 1, 1997.

District	*Group A Extra*	*Group B Advanced*	*Group C Tech/Gen*	*Group D Novice*
0	AB0EW	KI0HM	++	KC0AIR
1	AA1RX	KE1HL	N1YWB	KB1CDF
2	AB2DK	KG2KS	++	KC2BGQ
3	AA3PO	KE3ZI	N3YZS	KB3BST
4	AF4BV	KU4EV	++	KF4QIR
5	AC5LX	KM5IC	++	KC5ZSK
6	AD6AV	KQ6NW	++	KF6JXT
7	AB7UQ	KK7GL	++	KC7VMM
8	AA8ZU	KI8BQ	++	KC8GTE
9	AA9UG	KG9JZ	++	KB9PZR
N Mariana Is	NH0A	AH0AX	KH0GS	WH0ABG
Guam	#	AH2DC	KH2RM	WH2ANT
Hawaii	AH7S	AH6PA	KH7DJ	WH6DDT
Amer Samoa	AH8O	AH8AH	KH8DH	WH8ABF
Alaska	AL0D	AL7QT	KL0FM	WL7CUE
Virgin Islands	++	KP2CJ	NP2JQ	WP2AIH
Puerto Rico	NP3C	KP3AR	NP3MI	WP4NMZ

New prefixes are available for this block, but none have been issued.
++All call signs in this group have been issued in this area.

by educators or telecommunications professionals also are eligible for this award, as long as a student is the first author. Deadline for receipt of finished student paper manuscripts is June 20, 1997. *Please note:* This deadline is different than the general conference submission date.

The conference has scheduled seminars and symposiums on Friday afternoon and Sunday. Conference papers, selected topics thread, lunch, and dinner are on Saturday. Symposiums held at this year's DCC will include a full-day symposium on *APRS* packet-location software, a half-day symposium on spread spectrum system design and theory, and a half-day seminar on Friday entitled "RF Basics for Computer Weenies: Helping the RF-Challenged Get the Most Out of the New High-Speed Wireless Toys."

For more information, contact TAPR, 8987-309 E Tanque Verde Rd, No. 337, Tucson, AZ 85749-9399; tel 817-383-0000; fax 817-566-2544; e-mail **tapr@tapr.org**; WWW **http://www.tapr.org**.

LIFE MEMBERS ELECTED APRIL 11, 1997

David Allday, KD6LAY; Tahir Ayub, KB2TWY; F. K. Ben, WØFDL; Arline F. Berry, W1LIO; Michael F. Brugger, N8CEY; Loran K. Calvert, KD6VFJ; Mark Casey, N1LZC; Francis M. Cravey, N4OGP; Clark R. Davis, N7CR; Thomas E. Deegan, KB2YAZ; Franz J. Franken, DG1KFF; Douglas C. Gomez, KC6RCM; Robert B. Gottschalk, Jr, K4ADV; Larry A. Greene, N7LG; Michael J. Hahn, KGØXU; Brian Harris, WA5UEK; Frank L. Hoffman, WB7DZG; Allan F. Johnson, N4IYV; Kent Kennedy, WBØVIU; Tsuruo Kobayashi, JH1XVY; John Lash, WA2GO; William T. Leslie, WA6POK; Joseph MacNaughton, N7WAP; Bruce R. Marks, KB2XP; H. L. Marks, KC6RKO; Robert T. Martin, N6MZV; Mark D. Mc Mullin, KM6HB; Juan S. Mendez; Robert C. Meyer, Jr, WØLAW; Evelyn B. Miller, KE6YXB; Tuck Miller, KC6ZEC; William P. Morris, W7IH; Theodore C. Nicholson, KW9R; Nancy R. Noordhof, KC5IWT; Nico L. Noordhof, KC5IWS; Leonard J. Popyack, WF2V; Anthony C. Radebaugh, NØNI; Paul W. Rollman, Jr, KB2RUZ; Robert A. Roske, WAØCLR; Randy T. Sandstrom, N4SXX; Jackie Scholes, KB6LLC; Coley Scott, Jr, KB5RZZ; Debra C. Scott, KC5BLM; John D. Seibert, K3BSY; Hiroshi Shiraishi, JA2NDQ; David H. Tamres, KB9IIF; Edward Terrazzi, VK7JET; Marsha M. Walters, KA7SDV; Kok Aun' Yeoh, KBØYLT; David Yingling, WØUW; Tak Yokoi, KO6NR; Robert J. Zavrel, Jr, W7SX.

In Brief

• **Welcome to the ARRL staff:** Walter E. Ireland, WB7CSL, accepted the position of Technical Specialist in the ARRL Washington Office, effective April 1. He directly assists Technical Relations Manager Paul Rinaldo, W4RI. Walt was first licensed as K1FUW in 1963. He has just taken early retirement from the federal government, his most recent position being Chief, Spectrum Management and Regulatory Affairs Division, International Broadcasting Bureau, US Information Agency, a position he held for six years. Prior to that he worked for the Board for International Broadcasting (RFE/RL) and the Voice of America in various technical management capacities.—*David Sumner, K1ZZ*

• **Welcome to HQ:** Dan Miller, K3UFG, joined the ARRL Educational Activities Department on April 17. His primary duties will involve deciding on new videos to add to the EAD tape library, working on the *Novice/Tech Instructor Guide*, working with NASA on the evaluation system for SAREX lesson plans, and other activities. Dan, 51, is from Erie, Pennsylvania, and holds an Advanced class license. In the past, he has done school demonstrations involving SAREX, taught licensing classes, edited a club newsletter, been an active traffic handler, and served as president of Radio Amateurs of Erie. To reach Dan Miller, call 860-594-0340.

• **New e-mail address for e-pubs, software support:** Effective immediately, the e-mail address for support of ARRL electronic publications and software is **epubs@arrl.org**. The **tis@arrl.org** address remains valid for technical information service (TIS) inquiries.—*Jon Bloom, KE3Z*

• **HQ job opening:** ARRL Headquarters has a full-time opening for the position of Technical Information Service Coordinator. The position is in Newington, Connecticut. Candidates should have an associate degree in electronics technology or equivalent professional and amateur experience; an ability to deal with amateurs by mail, e-mail and telephone; an ability to work with outside volunteers; and broadbased familiarity with a number of modes currently in use by amateurs. Writing skills, and familiarity with PCs, databases and project management are important pluses. Starting salary is in the mid-20s. Send a resume and salary expectations to R. Boucher, ARRL, 225 Main St, Newington, CT 06111; fax 860-594-0298; e-mail **rboucher@arrl.org**. The ARRL is an equal opportunity employer.

• **IRCI gets new owner:** George Cutsogeorge, W2VJN, and his wife, Georgia Frenchs, of Umpqua, Oregon, have purchased International Radio and Computers, Inc/Fox Tango of Florida. The company, to be known as International Radio, was due to reopen May 1. It will supply crystal filters, enhancement kits and newsletters initially, as IRCI did previously. For more information, call 541-459-5623 (9AM to 1 PM Pacific Time, Tuesdays through Saturday); fax 541-459-5632; e-mail **inrad@rosenet.net**; WWW **http://www.qth.com/inrad**.

• **Gilfer Shortwave out of business:** Gilfer Shortwave of Park Ridge, New Jersey, is the latest casualty in the sagging radio hobby market, according to a reliable industry source. The company, which had been in business for more than four decades, had billed itself as "America's Premier SWL Center," but also sold some Amateur Radio equipment, accessories and books. Paul Lannuier, N2HIE, took over Gilfer a few years ago and served as Gilfer's president and technical director. Calls to Gilfer's telephones go unanswered, and the company's Web site is now dark.

• **FCC proposes electronic comments:** The FCC has proposed to allow electronic comments to be filed in all FCC informal notice and comment rulemaking proceedings conducted under Section 553 of the Administrative Procedure Act, except for broadcast allotment proceedings. The Commission adopted a Notice of Proposed Rulemaking April 3 (Docket GC 97-113) to permit filing comments via the World Wide Web and e-mail.—*FCC*

• **HAARP test results:** Ed Kennedy, K3NS, reports that preliminary HAARP listening test results and reports are available at **http://server5550.itd.nrl.navy.mil/projects/haarp/hhtest.html** on the Web. The reports suggest that best reception of the 6.99-MHz signal was on the West Coast and in Alaska.

• **George Jacobs, W3ASK, wins award:** Propagation guru George Jacobs, W3ASK, has won the National Association of Broadcasters' 1997 Radio Engineering Achievement Award. Jacobs, who was instrumental in developing and launching the Voice of America and modernizing the facilities of Radio Free Europe and Radio Liberty, received the award April 9 during the NAB's technology luncheon. Jacobs, president of George Jacobs and Associates Inc, is well-known worldwide in shortwave broadcasting, having represented the US at a number of international telecommunications conferences. Jacobs has written the monthly propagation report for *CQ* since 1951 and is the magazine's longest-tenured columnist.

• **New frequency for *Ham Radio & More*:** The *Ham Radio & More* show celebrated six years on the air on April 20. Due to the change to Daylight Time, the program's shortwave broadcast frequency on WWCR has changed to 12.160 MHz. *Ham Radio & More* airs live Sundays at 2200 UTC. Tape-delayed broadcasts air on WWCR Tuesdays, 0800 UTC, on 3.210 MHz, and Sundays, 0500 UTC, on 5.070 MHz. For more information, check out **http://www.goodnet.com/~lenwink/hrm.htm** on the Web.

QST

Moved & Seconded

MINUTES OF THE EXECUTIVE COMMITTEE
Number 452
St. Louis, Missouri
April 12, 1997

Agenda
1. Approval of minutes of January 16, 1997, Executive Committee meeting
2. FCC matters
3. Legislative matters
4. Antenna/RFI matters
5. Other legal matters
6. International matters
7. Organizational matters
8. Recognition of new Life Members
9. Affiliation of clubs
10. Approval of conventions
11. Date and place of next meeting
12. Other business

Pursuant to due notice, the Executive Committee of the American Radio Relay League, Inc., met at 8:30 AM Saturday, April 12, 1997, at the Airport Marriott Hotel, St. Louis, Missouri. Present were President Rodney Stafford, KB6ZV, in the Chair; First Vice President Stephen A. Mendelsohn, W2ML; Executive Vice President David Sumner, K1ZZ; and Directors Mary Lou Brown, NM7N, Frank Butler, W4RH, Kay Craigie, WT3P, and Fried Heyn, WA6WZO. Also present were General Counsel Christopher D. Imlay, W3KD, and Legislative and Public Affairs Manager Steve Mansfield, N1MZA.

1. On motion of Mr. Heyn, the minutes of the January 16, 1997, Executive Committee meeting were approved in the form in which they had been distributed.

2. Mr. Imlay reported on FCC matters as follows:

2.1. Status of recently completed and pending rulemaking proceedings:

2.1.1. ET Docket 96-102, re: unlicensed National Information Infrastructure devices in the vicinity of 5 GHz. Three petitions for reconsideration were filed by various industry groups, only one of which, from Apple Computer, Inc., concerned the amateur allocation. The ARRL has filed comments opposing Apple's requests insofar as they would increase the potential for interference to amateur operations.

2.1.2. ET Docket 96-8, re: the use of directional antennas on Part 15 spread spectrum devices in the 2450 and 5800 MHz bands. At its April 3 meeting, the FCC relaxed the restrictions on the use of directional antennas in conjunction with these devices.

2.1.3. GN Docket 96-228, re: implementation of Wireless Communications Service (WCS) in the bands 2305-2320 and 2345-2360 MHz. The auctioning of these bands was mandated by Congress, so the FCC had no choice but to comply. The Amateur Service is now secondary to WCS in the band 2305-2310 MHz. We are seeking an upgrading of the Amateur Service allocation at 2300-2305 MHz to primary, via a Petition for Further Rule Making in ET Docket 94-32.

2.1.4. IB Docket 97-95, re: Fixed-Satellite Services in the band 36-51.4 GHz. In a Notice of Proposed Rule Making released March 24, 1997, the FCC has proposed to make no change in the Amateur/Amateur-Satellite allocation at 47.0-47.2 GHz.

2.1.5. MD Docket 96-186, re: FCC fee schedule for fiscal year 1997. The schedule calls for an increase from $3 to $5 per year in the fee for an amateur vanity call sign. Thus, the ten-year fee would go from $30 to $50. On motion of Mrs. Craigie, the General Counsel was instructed to file reply comments seeking, in the interest of fairness, a postponement in the implementation of the higher fee until after all four vanity call sign gates have been opened and all amateurs have had an opportunity to request a specific call sign for the existing fee.

2.1.6. ET Docket 97-94, re: equipment authorization procedures. A Notice of Proposed Rule Making has been issued, proposing to streamline the Commission's procedures for authorization of consumer electronic equipment and other devices. No changes are proposed in the testing requirements, nor is any relaxation of substantive requirements proposed. It appears to be unnecessary for the ARRL to file comments in the proceeding.

2.1.7. WT Docket 97-12, re: spreading codes for spread spectrum emissions in the Amateur Service. The NPRM, on which comments are due on May 5 and reply comments on June 5, proposes almost exactly what the ARRL had requested in its petition, RM-8737. Accordingly, in its comments the ARRL will support the FCC's proposals.

2.1.8. WT Docket 96-188, re: implementation of the International Amateur Radio Permit. The comment and reply comment periods in this proceeding have closed and final action is awaited.

2.1.9. 219-MHz waiver. The FCC's Private Wireless Division has granted waivers of §80.453 to Orion Telecom, Inc., to permit the company to provide service, on a secondary basis, to a limited number of land mobile stations from certain of its Automated Maritime Telecommunications System (AMTS) coast stations in California. The licensee has not been cooperative in accommodating amateur digital forwarding operations in the 219-220 MHz band. A proliferation of such waivers could further reduce the opportunities for amateurs to use this band.

2.1.10. ET Docket 93-62, re: RF exposure. The FCC is reviewing the numerous petitions for reconsideration, including that of the ARRL. The revised OET Bulletin 65 has not yet been released. It is expected to be released shortly in the form of a core document, with separate supplements for the various radio services.

2.1.11. WT Docket 95-57, "omnibus" amateur rules proceeding. The Report and Order in this proceeding was released April 1, 1997. On motion of Mr. Heyn, staff was instructed to develop a plan for ARRL participation in the special event call sign program that has been adopted by the Commission, that the plan provide for appropriate limits on the number and duration of use of 1x1 call signs by an individual, and that it require a minimum of administration and be offered at no cost to the amateur community.

2.1.12. Mr. Imlay advised the committee that he had been approached by an attorney representing Sierra Digital Communications, Inc., which plans to seek a partial waiver of §15.249 of the FCC Rules governing the field strength of emissions from intentional radiators in the band 24.0-24.25 GHz. The League was asked to agree that the waiver would not have any adverse effect on the Amateur Radio community. After review, the Executive Committee concluded that in view of the frequency range and power level being sought, adverse effects on amateur operation could not be ruled out. Mr. Imlay was asked to convey this conclusion to the attorney, with appreciation for our having been consulted.

2.2. Review of status of petitions for rulemaking authorized by the Board. Mr. Imlay noted that the League's petition to permit Advanced class Volunteer Examiners to administer General class examinations, filed on October 28, 1996, has not yet been given a file number. The petition to relax certain RACES rules, authorized at Minute 62 of the October 1996 meeting of the Board, was filed on March 12. The petition to allow direct submission of private sector complaints of serious rule violations to the Chief Administrative Law Judge, authorized at Minute 25 of the October 1996 meeting of the Board, was filed on March 28. The petition to authorize amateur operation in American Samoa in the band 7100-7300 kHz, authorized at Minute 67 of the October 1996 meeting of the Board, has been delayed pending completion of analysis of technical showings to support the request.

2.3. Report on status of EDAP Technomed, Inc., Part 18 waiver request. This company filed a waiver request with the FCC on May 23, 1996, to allow the marketing of a medical device operating at 1296 MHz at power levels significantly above those permitted for such devices in this frequency band. The ARRL has filed a series of comments in opposition to this waiver request, citing among other things the company's apparent lack of candor in claiming to the FCC that hospital walls would attenuate their signal and reduce interference while at the same time marketing the device (in apparent violation of FCC rules) for portable applications. The most recent development is that the ARRL has asked amateurs who stand to be directly affected by the operation of this device to comment directly to the FCC, and numerous amateurs have done so.

2.4. Vanity call sign program. At Minute 2.3 of the January 16, 1997, meeting of the Executive Committee, Mr. Imlay was asked, informally, to investigate what alternatives may be available to address concerns about certain cases in which multiple vanity call signs have been issued to club stations having the same trustee. Mr. Imlay reported that in the absence of evidence of trafficking in call signs for profit, no enforcement assistance could be expected from the FCC. The committee discussed various options for rule making but took no formal action.

2.5. Executive Committee study of adequacy of FCC rules governing Volunteer Examiner qualifications (Minute 53, January 1997 Board Meeting). Mr. Imlay reported the results of his study of the applicability of the Americans with Disabilities Act of 1990 (ADA) to the VE accreditation process, noting that the FCC has determined that the ADA does not apply to telecommunications services other than broadcast and common carrier licensees. ARRL VEs certify their understanding that if they are not able or competent to perform certain VE functions required for any particular examination, they should not administer that examination. On motion of Mr. Heyn, it was voted to recommend to the Board the adoption of a policy that ARRL Volunteer Examiners be instructed to not administer examination elements that they have not passed themselves.

2.6. Executive Committee study of abuses of Morse code examination element waivers (Minute 55, January 1997 Board Meeting). Mr. Imlay and Mr. Sumner had prepared reports on this topic. Mr. Imlay's report provided background on how the existing rules and procedures concerning Morse code examination waivers had come about. Mr. Sumner's report discussed possible options for reducing the potential for abuse. After discussion, during which the committee was in recess for luncheon from 12:02 to 12:42 PM, on motion of Mr. Heyn, it was voted that the committee recommend to the Board that the following changes in rules or procedures be requested of the FCC: (1) To be accepted by a VE team, a physician's certification stating that an individual is unable to pass a 13 or 20 word-per-minute telegraphy examination because of a severe handicap, the duration of which will extend more than 365 days beyond the date of the certification, must be accompanied by evidence that the individual has made an attempt to pass the examination by being accommodated in accordance with §97.509(k); and (2) VECs shall be authorized and required to request from the physician, on behalf of the FCC, medical information pertaining to the individual's handicap, and shall not process the Form 610 until the information is received.

2.7. At this point, consideration was given to whether the ARRL should request reconsideration of the FCC's decisions in WT Docket 95-57, the "omnibus" amateur rules proceeding. No motions were offered.

3. Mr. Mansfield reported on legislative matters as follows:

3.1. At the request of Mr. Stafford, Mr. Mansfield provided information to the committee concerning The Presidents' Summit for America's Future, which is to be held in Philadelphia April 27-29 and is co-chaired by Presidents Clinton and Bush. The Summit's goal is to mobilize millions of

citizens and thousands of organizations from all sectors in order to ensure that all of the nation's youth have access to the resources that can help them lead healthy, fulfilling and productive lives. Participating organizations make specific, measurable commitments toward this goal. On motion of Mrs. Brown, staff was instructed to develop a proposal for ARRL participation in this initiative.

3.2. Representative Eshoo and 21 co-sponsors have introduced HR 1013, the Amateur Radio Volunteer Services Act of 1997. The bill seeks, for volunteers performing specific functions on behalf of the FCC, the same liability protections that they would be afforded if they were FCC employees.

3.3. Senator Feingold has been revising the bill that he introduced in the 104th Congress as S 2025, which would have permitted local authorities to act against users of illegal CB equipment. The ARRL had serious concerns with regard to certain provisions of S 2025. Senator Feingold's staff has been very cooperative in working with the League to resolve these concerns prior to the reintroduction of the legislation.

3.4. Mr. Sumner had conveyed to the committee a recommendation from the Volunteer Resources Committee that the League seek an increase in the legislative cap on volunteer examination fee reimbursement. The existing cap, which is adjusted annually for inflation and is now $6.26, was set in 1983 at $4.00. Since that time, the services being provided by VECs at additional cost to them have expanded to include, among others, maintenance of the question pools and electronic filing of applications. An increase in the cap would not necessarily result in an increase in the fee set by ARRL/VEC or any other VEC, since each VEC is free to set its own fee as long as it does not exceed either the cap or actual out-of-pocket costs. On motion of Mr. Heyn, the Secretary was instructed to submit for mail vote by the Board of Directors the following resolution: "Resolved, that the ARRL shall seek amendment of Section 4(f)(4)(J) of the Communications Act to set the total amount of allowable cost reimbursement per examinee at a maximum of $9.00, adjusted annually every January 1 for changes in the Department of Labor Consumer Price Index."

4. Antenna/RFI matters. Mr. Imlay noted that there is no pending antenna litigation of national significance of which he is aware. However, covenant restrictions continue to be of great concern. Also, new zoning regulations are being developed in many jurisdictions in response to the Telecommunications Act of 1996, which requires the accommodation of wireless communications systems; these new regulations must be monitored on a case-by-case basis to ensure they do not impose new restrictions on amateurs.

5. Mr. Imlay reported that in a case involving a Mississippi amateur, the FCC General Counsel's office has supplied a very useful letter confirming the exclusive authority of the FCC to regulate radio frequency interference. The letter concludes, "State or local court actions that require amateurs or other licensees to cease operations or incur penalties as a consequence of radio interference thus have been entirely preempted by Congress."

6. International matters:

6.1. Mr. Sumner noted the hiring, effective April 1, of Walter E. Ireland, WB7CSL, in the capacity of Technical Specialist in the Washington office. He is assisting Technical Relations Manager Paul Rinaldo, W4RI, in preparations for WRC-97 and WRC-99.

6.2. Mr. Stafford noted that the IARU Region 3 Conference will be held in Beijing September 8-12, 1997. The ARRL delegation will consist of Messrs. Stafford, Mendelsohn, Sumner, Rinaldo, and International Programs Manager Naoki Akiyama, NX1L. International Affairs Vice President Larry Price, W4RA, will attend in his capacity as Secretary of the IARU.

6.3. Mr. Stafford noted the timetable for consultation between the ARRL, as International Secretariat, and the IARU Administrative Council concerning the nomination of candidates for IARU President and Vice President for the term of office beginning May 9, 1999.

7. Organizational matters:

7.1. The committee reviewed the ARRL Articles of Association, with the exception of Article 11, and identified several possible amendments that would provide useful clarification. Review of the Bylaws was held over to the next meeting. Review of Article 11 is being conducted by a subcommittee.

7.2. As chairman, Mr. Mendelsohn reported on behalf of the subcommittee that is charged with developing a Board Member Code of Ethics and reviewing Article 11. The subcommittee's work on a possible code of ethics has reached the stage where a draft can be circulated to the full Executive Committee for discussion. Work on Article 11 continues.

7.3. The committee reviewed the status of planning for the 1997 ARRL National Convention in Jacksonville. Committee members expressed satisfaction with convention preparations.

7.4. Mr. Imlay reported that work on the trademark application ordered by the Executive Committee at Minute 10.2 of the January 16, 1997, meeting is almost complete.

7.5. Without taking formal action, the committee reviewed ARRL/VEC policies concerning the suspension and disaccreditation of Volunteer Examiners.

7.6. The committee reviewed a draft business plan for an ARRL National Public Service Conference. After discussion, staff was requested to take the committee's comments into account in preparing, instead, a plan for a series of regional conferences in 1998, to be held in conjunction with established conventions.

7.7. Mr. Sumner presented a report on ARRL advertising policies that he had been requested to prepare. After discussion, on motion of Mr. Heyn, it was voted that the policy with regard to simplex autopatch advertising that was adopted by the Executive Committee on May 25, 1984, is rescinded. Discussion of other aspects of ARRL advertising policies was postponed until the next meeting of the Executive Committee.

7.8. Mr. Sumner reported on the status of planning for the implementation of an ARRL audio news service. Committee members expressed the desire that planning be completed prior to the July Board Meeting.

7.9. An ARRL Spectrum Forum, utilizing electronic mail, was created at Minute 51 of the January 1997 Meeting of the Board. It was agreed that Mr. Mendelsohn will serve as moderator of the forum, and will work with staff to develop criteria for participation.

7.10. Mr. Imlay reported that work is in progress in his office to implement Minute 52 of the January 1997 Board Meeting, concerning Alternative Dispute Resolution (ADR).

7.11. It was agreed that a review of the existing policy governing the distribution of publications to League officials would be placed on the agenda for the next meeting.

7.12. The Computer Committee and Chief Financial Officer Barry Shelley, N1VXY, were asked jointly to investigate improving the protections against the transmission of computer viruses through the ARRL electronic mail system.

7.13. On behalf of the Administration and Finance Committee, of which he is a member, Mr. Mendelsohn noted that the League's financial performance for the first quarter of 1997 had exceeded the budget plan, thanks to the good work of staff. As an unintended consequence of a procedural change in how the annual financial plan is approved by the Board, the division budgets were not included in the minutes of the 1997 Annual Meeting of the Board. The budgeted amounts for each division are: Atlantic, $13,500; Central, $7,500; Dakota, $4,700; Delta, $8,800; Great Lakes, $12,000; Hudson, $9,500; Midwest, $8,000; New England, $9,200; Northwestern, $14,650; Pacific, $13,700; Roanoke, $11,300; Rocky Mountain, $7,900; Southeastern, $13,576; Southwestern, $15,500; West Gulf, $12,700.

7.14. On behalf of the Computer Committee, of which he is chairman, Mr. Mendelsohn reported that Information Services Manager Deane Potter has left the League's employ. As a consequence, implementation of the new computer system may be delayed. He also noted the need to disseminate the World Wide Web policy that had been adopted by the Board at Minute 25 of its July 1996 Meeting.

8. On motion of Mr. Butler, 47 newly elected life members were recognized and the Executive Vice President was instructed to list their names in *QST* (see "Happenings" in this issue).

9. Affiliated club matters:

9.1. On motion of Mrs. Craigie, the following clubs were declared affiliated:

Category 1

Amateur Radio Computer Society, Des Moines, IA

Arkansas Radio Emergency Service, Alexander, AR

David Sarnoff Radio Club, Plainsboro, NJ

Desoto Amateur Radio Club, Inc., Nocatee, FL

Emergency Services Amateur Radio Association, Terrell, TX

Estill County Ham Organization, Irving, KY

50 MHz and Up Group of Northern California, San Jose, CA

Lake Isabella Amateur Radio Association, Lake Isabella, CA

Pawtuxet Valley Amateur Radio Club, West Warwick, RI

Plainville Amateur Radio Club, Plainville, CT

Radio Operadores del Este, Luquillo, PR

Robert D. Grant United Labor Amateur Radio Association, Nutley, NJ

Rural Amateur Radio Association, Tonopah, NV

Scott County Amateur Radio Society, Gate City, VA

Siloam Springs Amateur Radio Club, Inc., Siloam Springs, AR

Southeastern VHF Society, Atlanta, GA

Tama Amateur Radio Society, Toledo, IA

Tennessee Contest Group, Pegram, TN

Toledo Bend Amateur Radio Club, Hemphill, TX

Category 3

Henley Schools Amateur Radio Club, Klamath Falls, OR

Kansas State University-Salina Amateur Radio Club, Salina, KS

N. A. Chaderjian School Amateur Radio Club, Stockton, CA

Sikeston Middle School Amateur Radio Club, Sikeston, MO

TYL Middle School Amateur Radio Club, Oakdale, CT

The ARRL now has the following numbers of active affiliated clubs: Category 1, 1896; Category 2, 25; Category 3, 153; Category 4, 10; total, 2084.

9.2. On motion of Mr. Butler, it was voted that the Executive Committee recommends to the Board the adoption as ARRL policy that the minimum number of members for a Category 1 affiliated club be four.

10. On motion of Mr. Butler, the holding of the following ARRL conventions was approved:

Texas State, June 6-8, 1997, Arlington, TX

Georgia Section, June 13-14, 1997, Albany, GA

Arizona State, July 25-27, 1997, Flagstaff, AZ

South Texas Section, August 1-3, 1997, Austin, TX

Eastern Washington Section, August 2-3, 1997, Spokane, WA

Alabama Section, August 16-17, 1997, Huntsville, AL

Colorado State, August 17, 1997, Golden, CO

New Orleans International DX, August 22-23, 1997, New Orleans, LA

West Virginia State, August 23, 1997, Weston, WV

W9DXCC, September 6, 1997, Rolling Meadows, IL

Pacific Division, October 17-19, 1997, Concord, CA

West Gulf Division, October 17-19, 1997, Humble (Houston), TX

South Carolina State, October 25, 1997, Sumter, SC

The following conventions had been approved previously by mail vote:

Southeastern VHF Conference, April 4-5, 1997, Atlanta, GA

International DX, April 4-6, 1997, Fresno, CA

Delta Division, April 25-26, 1997, Little Rock, AR

Eastern New York Section, April 27, 1997, Poughkeepsie, NY

West Texas Section, May 3-4, 1997, Abilene, TX

11. It was agreed that the next meeting of the Executive Committee will be held on Thursday, July 17, 1997, at 2:00 PM, in Rocky Hill, Connecticut. Business will include a review of ARRL strategic planning and selection of strategies to be recommended to the Board for inclusion in the 1998-1999 plan.

12. There being no further business, the meeting was adjourned at 5:55 PM.

Respectfully submitted,

David Sumner, K1ZZ
Secretary

How's DX?

*Edited by **Bill Kennamer, K5FUV** • DXCC Manager*

Contest DXpedition to Mongolia—The JT1Z Story

Art Goddard, W6XD, Southwestern Division vice director, went with a group of Southern California Contest Club members to Mongolia in 1995. This group has set for itself the goal of operating in the CQ WW DX Contest from all 40 Zones. The target of opportunity this year was one of the rarer zones, 23, which contains the Tanna Tuva area of Russia, a small part of China, and Mongolia. As the rarest country of the three, Mongolia was the natural choice for the group.

The group was hosted by the Mongolian Radio Sports Federation (MRSF). Since the object was to operate in the CQ WW SSB Contest, it was decided to operate in the multi-multi category as a joint Mongolian-US effort. The station was set up at the MRSF headquarters station, JT1KAA, and was issued the special call sign JT1Z. "Ulzi" Ulziysaikhan, JT1CG, is secretary of the MRSF.

The group reports that operating from Zone 23 is a great thrill, and that the hosts were the greatest! MRSF invites other US operators to visit and operate. Anyone interested should contact G. Ulziysaikhan, JT1CG, Mongolian Radio Sports Federation, PO Box 639, Ulaan Baatar 13, Mongolia.

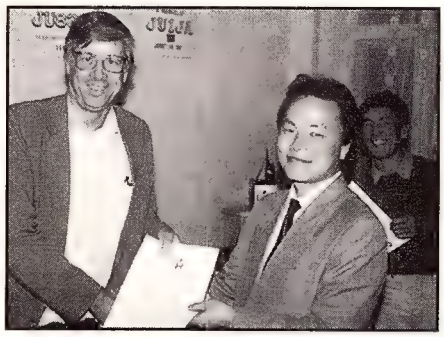
Club Notes

The West Jersey DX Group, an ARRL affiliated club for over 10 years, invites interested DXers in western New Jersey to contact them. The club constitution requires its members to encourage and assist others to achieve DXCC and Honor Roll.

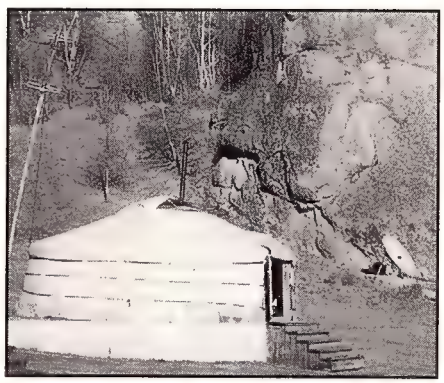
The 1997 club officers include President Marty Grozinski, W2CG; Vice President Pete Pellack, NO2R; Treasurer Keith Bert, KB5U; and Secretary/Recorder Larry Puccio, K2QDY. Correspondence may be sent to West Jersey DX Group, Box 6772, Bridgewater, NJ 08807

DX Aku

DX Aku: Messages from the Easter Island DXpedition, by Robert W. Schmieder, KK6EK, isn't really about Easter Island, although the XRØY story is surely told. It's about vision, technology, innovation and Bob's desire to be the Moses who leads us out of the wilderness—his desire to redefine DXing as we know it. DX Aku refers to the kinetic spirit affecting Schmieder's DX activity, and he talks to that spirit as it



In order to operate, one must first get a license. Ulzi, JT1CG (r), presents the JT1Z license to Dick Norton, N6AA.



The modern Mongolian ham shack—a traditional "ger," equipped with VHF crossed dipoles and a parabolic dish. Gers are made of layers of felt laid over a wooden lattice and covered with canvas. Handmade rope secures the canvas and felt to the frame. The typical setup time is 30 minutes—just right for Field Day!

The Hangai Apartments on Peace Avenue. Most of the population of Ulan Bator lives in either an apartment or in "gers," the traditional Mongolian dwelling.

A view of Ulan Bator and the Gandan Monastery (Gandan Hiid), built in 1840. Many temples and monasteries were destroyed during the purges of 1937, but Gandan Hiid was spared. Approximately 150 Buddhist monks are in residence.

The government office building that houses MRSF headquarters and JT1KAA. Antennas on the roof include a multiband Yagi, 6-meter Yagi, and an R-7 vertical. The Mongolian Radio Sports Federation occupies two offices on the second floor. Morse code classes are taught on the first floor.

The group's first meeting with their Mongolian hosts (l-r): Khathan Mongol, the group's translator; Chuluun, JT1BL; Tamir, JT1CF; Bat, JT1CS; and Ulzi, JT1CG.

Bat, JT1CS, at one of the operating positions.

Chuluun, JT1BL, in full operating mode.

The rooftop view from JT1KAA. The R-7 is down for maintenance. As usual, the building's maintenance crew decided to re-roof the building the day after the contest antennas were installed!

The full group (l-r): Mary Ellen, XYL of W6XD; Tamir, JT1CF; Tony, K6MC/JT1FAV; the group's driver; Mongol, the translator; Larry, N6TW/JT1FAZ; Chuluun, JT1BL; Dick, N6AA/JT1FAU; Ulzi, JT1CG; Phil, N6ZZ/JT1FAZ; Terry, W6MKB/JT1FAY; Art, W6XD/JT1FAW; and Bat, JT1CS.

guides him along his way on search for the new definition.

Bob talks to his personal DX Aku on his rides to and from work, and remarkable discoveries are made. For example, one morning the DX Aku says, "Use The Force, Bob."

"Oh, pull-eeze!" Bob replies.

"Use the force of *technology*, Bob," the Aku replies.

And then Bob says, "What suddenly flashed clearly before me was the surprising disparity between the level of technology that is currently available, and the level of technology that is currently used for radio DXpeditions. It seemed almost as if the sport was stuck in a low-technology rut." With this thought began the odyssey that became XRØY, and then went on further to become VKØIR.

Throughout the book, the DX Aku exchanges thoughts with Bob, as the DXpedition proceeds from idle thought to a full-blown event. Decisions are made, plans are made and unmade and technology is invented on the fly—all with the help of the DX Aku.

This book is not so much about radio operation, but about planning and promotion on a large scale. Easter Island is a nice place to visit—suitably exotic for the visitor, but not exactly a highly needed hot spot. Yet with the promotion and technology involved, this operation caught the fancy of the DXing public. New technology appeared for the first time, and the operation proved to be the test bed for the even more successful Heard Island DXpedition. As a study in the development of new DX technology, or as a study in the planning of a very large DXpedition, this book is a *must read*.

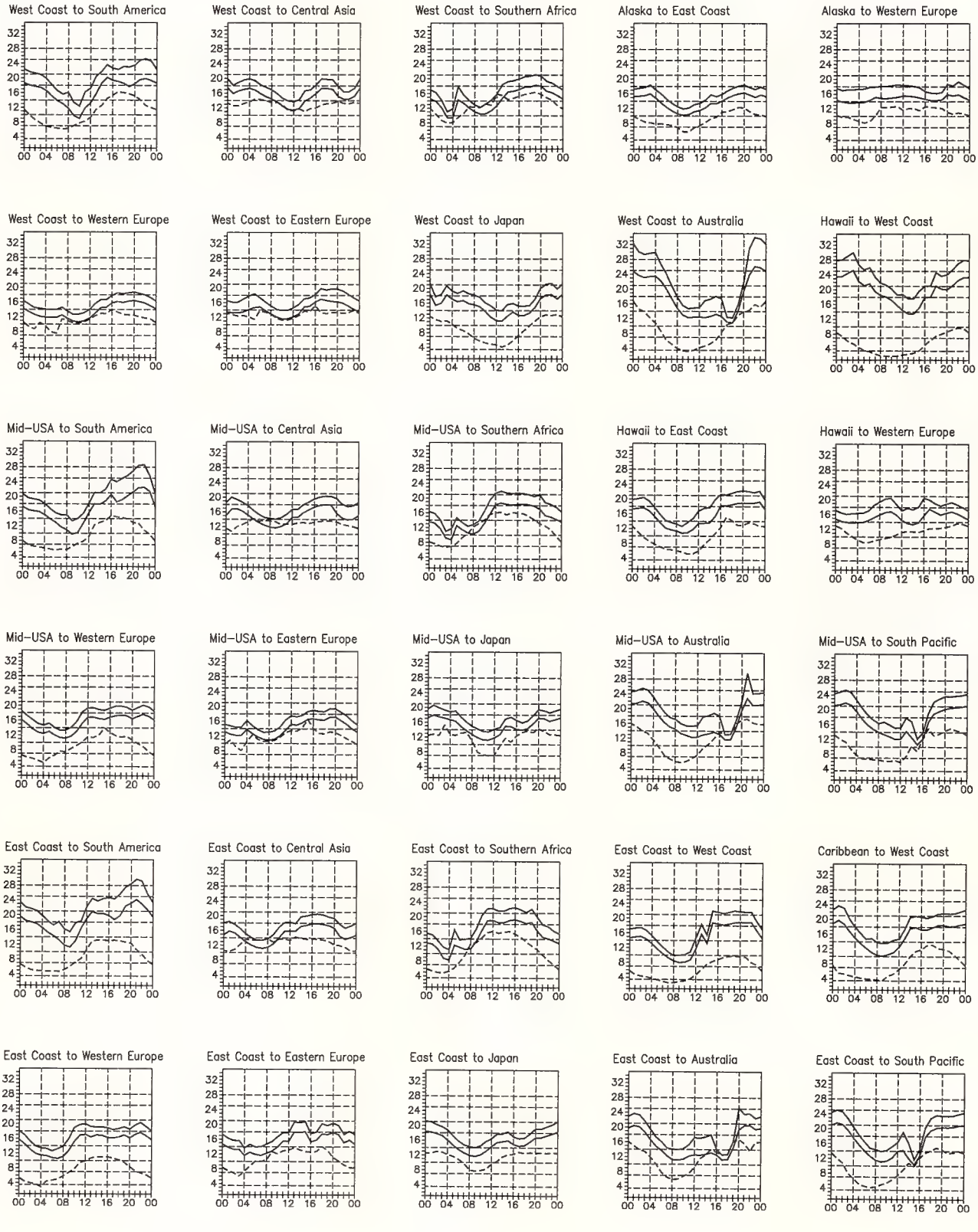
DX Aku is available from Cordell Expeditions, 4295 Walnut Blvd, Walnut Creek, CA 94596. Its price is $25 plus $3 shipping and handling.

1997 PACIFIC NORTHWEST DX CONVENTION

The 46th Annual Pacific Northwest DX Convention will be held July 25 through 27 at the Richmond Inn in Richmond, British Columbia, near Vancouver. The convention is jointly sponsored by the BC DX Club and the Fraser Valley DX Club.

Advance registration, due by June 30, 1997, and, including the banquet and breakfast, is US $45 or Canadian $55. Registration after June 30 or at the door is US $50 or Canadian $55.

For further information, US hams may contact Ken Thompson, VE7BXG, Box 3048, Blaine, WA 98231, and, in Canada, Allan Buckshon, VE7SZ, 24059 65th Ave, Langley, BC V2Y 2HI, Canada; **abucksho@direct.ca**.



When are the bands open? These charts, generated using IONCAP, show probabilities for average HF propagation from June 16 to July 15, 1997, for the paths indicated. The horizontal axes show Coordinated Universal Time (UTC), and the vertical axes frequency in MHz. On 10% of the days of this period, the highest frequencies propagated will be at least as high as the upper curves, and on 50% of the days they will be at least as high as the lower solid-line curves. The broken lines show the lowest usable frequency (LUF) for a 1500-W CW transmitter. For SSB or a lower transmitter power, the LUF will be somewhat higher than the curves indicate. See October 1994 *QST*, pp 27-30, and February 1995 *QST*, pp 34-36, for more details. The predictions for this period assume an observed 2800-MHz solar flux value of 82.

DX Century Club Awards

*Edited by **Bill Kennamer, K5FUV** • DXCC Manager*

The ARRL DXCC is awarded to amateurs who submit confirmation for contacts with 100 or more countries on *The ARRL DXCC Countries List*. The totals shown below are exact credits given to DXCC members from February 1 to 28, 1997. There were 329 current countries at that time. The DXCC rules and application forms are contained in *The ARRL DXCC Countries List*, available for $2 from Publication Sales.

NEW MEMBERS

Mixed

CX8DX/103
HL1AHS/213
IK5HHA/376
JS2XGS/105
RA2FZ/104
YO9BGV/101
YU1BDK/110
YV5AAX/241
N1VKO/100
W1EQ/147
WR1B/103
W3RMD/103
AE4FY/111
KA4RAB/141
WA4THR/127
KX5Y/103
N5UL/101
K8AJR/169
K8ARY/108
KE9KD/179
KG9FL/109
W9KX/160

Phone

G3PMR/248
HK6HKT/106
HL1AHS/213
HL5NLQ/113
VE3MSK/120
WB2VBR/104
W2BYW/175
AE4FY/101
KF4EJN/146
KR4WD/104
WA4THR/115
K6LLQ/132
WI6Z/110
W7YS/103
K8AJR/121
WA8VSJ/121
WD8ANZ/156
KG9FL/109
AA0FT/287

CW

DL3IAC/106
G3KWK/153
IK1IYU/137
JA7NUZ/111
JF1CZQ/285
SM7AML/181
KA6T/111
WA8VSJ/119
WB9Z/320
KG0EI/116

160 Meters

DJ4SO/107
DL1DA/104
HB9NL/101
HB9RG/100
JA2VPO/102
ON4ANT/111
K5UO/102
N5UL/101
K9BG/108

80 Meters

G3KWK/124
JH4UYB/118
SM5BEU/111
ZP5ALI/108
ND1T/109
N2NZ/106
WB4RFZ/101
WB9Z/277
K0MOL/101

40 Meters

DL3IAC/106
G3KWK/149
I0KDF/264
JA2JW/280
JF1CZQ/196
JH4UYB/134
SM5BEU/134
VE3MSK/120
YO5QAW/105
ZP5ALI/146
N2NZ/120
W3EYF/186
W6ENZ/188
W9SF/114

10 Meters

DJ9HX/109
G3KWK/117
I0KDF/249
IK1IYU/154
JF1CZQ/210
JH4UYB/110
LA5YBA/154
ZP5ALI/107
K6LLQ/134

6 Meters

DL9GU

NEW HONOR ROLL MEMBERS

Mixed
325

DJ4SO/338

323

SP5COK/330

322

DJ3QX/348
SP6CDK/327

321

IK5ACO/326

320

4X1AD/325

Phone
320

DJ6BN/331
JA6CNL/334
SP5COK/327

CW
323

PA0CLN/330

322

I4FTU/329

321

JA1CZI/329
JA4DEN/327
SM6DHU/328

320

NC1E/325

5B DXCC

ON4ALW
AB1U
ZP5ALI
KN4T
G3KWK
I0KDF
HB9BCK
EA7ARL
IK2DUU
KD5R
N9MR
K6BZ
HK7MQC
DJ9GR
WB2JZK
N2WB
Z31CZ

160 Meters

JA2VPO
DL1DA
JA4DEN

17 Meters

WB2JZK
N1KC

12 Meters

WB2JZK

ENDORSEMENTS

Mixed

DF5WA/301
DJ2TI/345
DJ4XA/354
DJ6BN/342
DJ9HX/331
DK5QK/343
EA3CWK/310
EA4MY/344
EX0M/219
F6DYY/335
F6DZO/320
G3KWK/307
G3PMR/294
G4DJC/260
GM3YOR/305
HA5LV/333
HB9BCK/303
HB9DDW/231
I4FTU/354
I8XVP/327
I0KDF/333
IK1IYU/328
IS0QDV/313
IT9JLA/343
JA1CZI/341
JA1IFP/355
JA3BLN/317
JA4DEN/336
JA5ALE/338
JA6GXP/344
JA6VA/351
JA7BJS/341
JA8GTA/338
JA8XJF/343
JA0BMS/331
JE3CHA/330
JF1CZQ/321
JF4AIS/261
JH4UYB/334
JH7BDS/337
JH8WXF/297
JH0BBE/334
JL3VWI/334
ON4ANT/305
PY2KP/322
SL0ZG/333
SM3BIZ/376
SM3PZG/314
SM5BEU/266
SM6DHU/355
SM6MSG/306
SM7AML/285
SM0AJU/371
SP9PT/352
VE1ACU/285
WP4G/307
ZP5ALI/268
Z31CZ/300
9L1PG/135
AB1U/332
K1ZZ/345
NC1E/330
N1AC/332
N1KC/256
WA1KUL/323
AA2F/300
KB2RA/329
N2NZ/311
N2WB/325
WA2BDP/309
WB2JZK/330
W2BYW/199
W2ML/247
W3KT/337
W3YZI/326
AD4Z/202
KA4KLU/175
KB4LCR/230
KC4VU/181
KN4T/328
KQ4AV/303
K4AA/247
K4ABC/332
K4EQ/200
K4KEY/303
K4VZ/262
K4XF/334
N4HK/318
N4IR/333
WY4I/317
W4AYF/263
W4EO/332
W4KHL/326
W4MK/127
W4QQN/352
W4SO/321
KD5R/244
K5EJ/343
WD5IQA/308
W5GO/332
W5MD/207
W5WLA/215
W5ZF/337
AA6JZ/283
KN6DQ/235
K6BZ/302
WA6TJM/332
WB6HTC/319
WN6W/316
W6EL/365
W6OK/315
W6ONZ/367
W6PHF/360
KB7YX/332
K7JJ/310
K7NTW/304
W7IUV/334
W7XN/333
AG8L/283
KQ8O/328
K8UNP/330
K8XP/348
N8DJX/333
WA8VSJ/187
WD8ANZ/167
W8ZET/364
KR9V/321
ND9O/245
NK9O/216
WB9JBH/295
W9MP/329
W9SF/287
AC0M/336
KA0BKR/331
N0JW/312
W0MS/298

Phone

CT1EEN/299
CT1END/240
DF5WA/231
DJ2TI/343
DJ3QX/348
DJ4XA/338
DJ9HX/269
DK5QK/336
EA3CWK/307
EA4MY/321
EA5BZS/298
EA7CRL/301
G3KWK/254
G4DJC/259
HB9BCK/278
HB9DDW/229
HB9DDZ/276
HK7MQC/295
I1LNU/334
I8XVP/327
I0KDF/333
IK1AOD/330
IK1IYU/328
IK5ACO/323
IK5EEG/297
IK5HHA/336
IK6SNR/296
IK6WQU/216
JA1CZI/207
JA1IFP/346
JA3BLN/305
JA6GXP/341
JA6VA/343
JA7BJS/339
JA8GTA/337
JA8XJF/343
JA0BMS/155
JE3CHA/279
JE8BKW/326
JF1CZQ/243
JH4UYB/310
JL3VWI/330
LA5YBA/234
ON4ANT/280
PY4OD/344
P43A/200
SL0ZG/333
SM3BIZ/375
SM3PZG/276
SM6DHU/350
SM6DYK/332
SM6MSG/274
SM0AJU/362
TI5KD/320
XE1NJ/317
YB5NOF/258
YO5QAW/154
ZP5ALI/267
4X1AD/320
AB1U/310
N1AC/325
N1KC/230
WA1KUL/312
K2EWB/340
KB2RA/329
N2WB/323
WA2BDP/309
WB2JZK/330
WE2N/218
W2ML/224
W2NNZ/317
W3KT/314
W3YZI/316
KB4LCR/229
KC4IKU/127
KE4SCY/158
KE4WY/300
KO4WM/180
KQ4AV/297
K4AA/215
K4ABC/292
K4EQ/130
K4HB/188
K4VZ/253
N4HK/318
WA4JTK/306
WY4I/241
W4AYF/263
W4KHL/325
W4UXI/319
K5EJ/321
K5PQK/332
WD5IQA/306
W5GO/332
KN6DQ/191
N6AWD/320
N6CFQ/293
WA6TJM/264
WN6W/266
W6EL/363
W6OK/314
KB7YX/332
AG8L/200
KQ8O/328
K8UNP/326
K8XP/340
N8DJX/333
WB8AMY/225
W8ZET/364
KR9V/318
ND9O/173
NK9O/215
WB9JBH/295
W9SF/249
AC0M/320
KB0C/330
W0GLG/311
W0MS/256

CW

CO2JD/160
DF5WA/283
DJ2TI/335
DJ4XA/327
DJ6BN/260
DJ9HX/236
DK5QK/298
DL1DA/305
EA4MY/338
G3PMR/281
GM3YOR/302
HB9BCK/166
HB9DDZ/309
JA1IFP/337
JA6CNL/325
JA6VA/336
JE3CHA/290
JE8BKW/319
JF4AIS/209
JH4UYB/294
JH7BDS/334
JH8WXF/251
JL3VWI/271
ON4ANT/267
PY2KP/321
PY4OD/319
SL0ZG/332
SM3PZG/281
SM5BEU/222
SM6MSG/282
SM0AJU/340
VE1ACU/282
AB1U/283
N1AC/319
N1KC/168
AA2F/253
KA2DIV/318
N2NZ/239
N2WB/222
W3KT/186
KA4KLU/156
KN4T/317
KQ4AV/215
K4ABC/308
K4EQ/179
K4KEY/231
K4UX/279
N4IR/332
N4RJ/339
W4UXI/281
KD5R/240
AA6JZ/228
KN6DQ/182
K6TS/316
WN6W/243
K7ABV/334
K7NTW/218
W7IUV/330
AG8L/270
K8UNP/269
K8XP/242
ND9O/162
N9MR/321
W9KX/160
W9SF/185
AC0M/295
K0GUG/329
W0MS/274

RTTY

DJ2TI/292
JA2VPO/252
JL3VWI/245
PA0TAU/139
SL0ZG/209
SM0AJU/314
K4ABC/264
K7NTW/176
K8UNP/151

Satellite

SM0AJU/105
K4UAS/196

160 Meters

DJ2TI/155
GM3YOR/122
JA4DEN/115
PA0TAU/155
SL0ZG/134
SM0AJU/200

80 Meters

DJ4XA/177
DJ9HX/188
DL1DA/123
GM3YOR/146
HB9DDZ/167
IK6GPZ/158
JE8BKW/124
ON4ANT/153
PA0TAU/250
SL0ZG/212
SM3PZG/141
SM6DHU/171
SM6DYK/235
SM0AJU/305
SP6CDK/283
XE1VIC/207
N1AC/200
KA2DIV/111
W4UXI/136
K8XP/152
ND9O/115
AC0M/165
W0MS/128

40 Meters

DJ4XA/244
DJ9HX/260
DL1DA/111
EA3CWK/154
GM3YOR/205
HB9DDZ/225
IK6GPZ/176
IK6SNR/159
JA1CZI/195
JA3BLN/111
JA0BMS/116
JE8BKW/211
JH8WXF/144
ON4ANT/172
PA0TAU/292
SL0ZG/280
SM3PZG/201
SM6DHU/242
SM6DYK/272
SM6MSG/150
SM0AJU/335
SP6CDK/293
TI5KD/218
XE1VIC/230
AB1U/140
N1AC/159
N1KC/119
KA2DIV/169
KN4T/104
KQ4AV/140
WB4RFZ/112
W4RDX/106
W4UXI/211
KN6DQ/112
K6TS/151
WN6W/155
AG8L/155
K8UNP/223
K8XP/193
AC0M/253
W0MS/171

10 Meters

DJ4XA/307
DL1DA/144
GM3YOR/178
HB9BCK/120
HB9DDZ/251
JA1CZI/159
JH0BBE/330
JL3VWI/276
LU1JDL/266
ON4ANT/195
PA0TAU/300
SL0ZG/277
SM3PZG/206
SM6DHU/280
SM6DYK/285
SM6MSG/244
TI5KD/235
XE1VIC/194
AB1U/192
N1AC/135
N2WB/159
KC4IKU/126
KQ4AV/137
WA4YLD/132
W4AYF/135
W4UXI/178
WD5IQA/126
W5GO/231
K6TS/168
WN6W/199
W7YS/129
AG8L/127
K8UNP/206
K8XP/144
WB9JBH/107
W0MS/196

6 Meters

JF1CZQ/107
ON4ANT/137

New Products

KLINGENFUSS FREQUENCY GUIDES

◊ Joerg Klingenfuss is offering a trio of updated 1997 frequency guides: *The 1997 Shortwave Frequency Guide*, *The 1997 Guide to Utility Radio Stations*, and *The 1997 Super Frequency List* on CD-ROM.

For detailed content descriptions and color screen shots, point your web browser to **http://ourworld.compuserve.com/homepages/Klingenfuss/**, or request a catalog from Klingenfuss Publications, Hagenloher Str. 14, D-72070 Tuebingen, Germany; tel 49 7071 62830, fax 49 7071 600849, e-mail **101550.514@compuserve.com**.

BELDEN 9913F COAXIAL CABLE FROM THE RF CONNECTION

◊ Belden's new 9913F low-loss coax is a flexible RG-8-type 50-Ω cable with a protective jacket and a high-density foam dielectric. Able to handle a tight 6-inch-bend radius, the new cable is perfect for rotator loops and tight corners.

Physical specs: first shield, 100% duobond II; second shield, 90% tinned copper braid; center conductor, 10 AWG bare copper (stranded). Power and attenuation range from 9200 W at 1 MHz (0.2 dB attenuation per 100 feet) to 65 W at 4 GHz (with 11 dB attenuation per 100 feet).

Price: 80 cents per foot ($1.08 list) with discounts starting at 100 feet. For more information, contact The RF Connection at 800-783-2666, fax 301-869-3860, WWW **http://www.therfc.com**.

FM & Repeaters

Edited by **Jay Mabey, NUØX** • Editor, The ARRL Repeater Directory

Where's the Radio?

When it comes to pure fun with a radio, there is one pursuit near and dear to my ham heart—*fox hunting*. Way back in the days when I was enjoying Amateur Radio for the first time (No, not *that* far back; Noah's ark wasn't radio equipped!) the fellows in my radio club (the Forx ARC in Grand Forks, North Dakota) held coffee klatches every Sunday evening. On this particular Sunday, after we had completed the ritual consumption, we decided to stage a transmitter hunt (ie, a "fox hunt"). Since I was the newbie, I was given the honor of being the "fox" for this excursion—accompanied by a seasoned veteran, of course!

What a blast! We spent hours driving the rest of the club members out of their minds. Like most foxes, we transmitted our 2-meter FM signal at regular intervals. The rest of the folks, equipped with all manner of fancy direction-finding antennas attached to their mobile or hand-held radios, attempted to get a fix on our position. They found us eventually, but we didn't make it easy for them.

After that first experience, I was hooked. I've participated in many hunts since then, both as hunter and hunted. I can testify from personal experience that fox hunting serves several useful purposes in addition to amusement. It allows hams to exercise their skills in locating "lost" transmitters in search-and-rescue operations. It also develops the designer's skills in constructing the "ultimate" fox-hunting antennas!

In these times of minimal sunspot activity, amateurs are struggling to maintain the interest in ham activity—and to keep club meetings and get-togethers interesting for members. What better way to involve newly licensed hams than fox hunting? They see exactly how useful their radios can be, they feel a part of the group, and they can learn the clever "tricks of the hunt."

And don't hesitate to reach out to the nonham public, too. Remember that *anyone* can participate as a hunter; you don't need a license to track down signals. It only takes a couple of enjoyable hunts to convince most of them to get their ham tickets.

It's a well-known fact that many new hams fall away from the hobby if they don't become immediately active. To reverse that trend we need vibrant clubs. Transmitter hunting may be one of the best ways to galvanize the membership and get them *active!* It's healthy for the club and healthy for the *hobby*.

HI, I'M SUPPOSED TO BE THE HIDDEN TRANSMITTER, BUT SOME OF THE RESIDENTS HERE FOUND ME FIRST---
I GUESS THIS IS REALLY A TV FRINGE AREA

State/Coordinator	Web Address
California—220 SMA	**http://www.vcnet.com/kn6la/220sma1.htm**
California—NARCC	**http://users.ccnet.com/~rwilkins/policy.html**
California—SCRRBA	**http://www.csun.edu/~wsmith/scrrba.htm**
California—TASMA	**http://www.primenet.com/~tasma/**
Florida—FRC	**http://home1.gte.net/k4lk/frc/index.htm**
Kansas—KARC	**http://www.pitton.com/~rcumings/KARC/**
Michigan—MARC	**http://www.michvhf.com/marc/**
New York—SLVRC	**http://www.igs.net/slvrc/**
New York—UNYREPCO	**http://spectra.net/~harvilch/unyrepco/**
Pennsylvania—ARCC	**http://www.arcc-inc.org/**
Wisconsin—WAR	**http://www.gmtcom.com/war**
SERA	**http://www.sera.org/**
T-MARC	**http://www.t-marc.org/**
TAPR	**http://www.tapr.org/directory**

Coordination Web Pages

Many frequency coordination entities have developed their own Web pages. This month I've included a partial list (above) that was compiled by Don Williams, WA4K, SERA vice president, SERA Virginia director and coordinator for Western Virginia.

Everyone who owns a repeater knows that the regional frequency coordinator is working to make the most efficient use of our extremely limited spectrum allocations. It is often a thankless job and the coordinators are all volunteers. Take a look at the Web pages and let their creators know what you think. Giving well-deserved "kudos" never hurt anyone!

Rick Palm, K1CE • *Field Services Manager*

"Coast Guard, Coast Guard..."

By Bob Stearns, KI7ZC
Emergency Coordinator, Clallam County
474 Southridge Rd
Port Angeles, WA 98363

Ed Brown,W7VNT; Stu Williamson, KC7GVG; and Mary Tate, KF7JX, at work in the radio room of the Clallam County EOC.

"...This is the Tanker *Cove Bay*. We have had a collision and are losing oil. This is a drill." Thus began a 36-hour drill involving the US Coast Guard, the Washington Department of Ecology and Department of Fish and Wildlife, and the Clallam County Amateur Radio Emergency Service (CC-ARES). The focus of the activity was a mythical oil tanker adrift in the Straits of Juan de Fuca separating Washington State's Olympic Peninsula from Canada. Most of the action took place in the City of Port Angeles in Clallam County, Washington.

The Coast Guard's National Strike Force plans, controls, and evaluates oil spill response drills to promote spill mitigation planning and training by Coast Guard and local government authorities. Until this time, the Coast Guard had not directly involved the services of Amateur Radio in the "drill play." In this drill, sealed information packets with weather information and oil flow characteristics were provided to CC-ARES members so observation post operators could inject realistic message traffic into the operation.

Pre-planning identified communication shortcomings in advance of the drill. Among them was the lack of effective field communication for the Washington Department of Fish and Wildlife (WDFW). This resulted in WDFW providing an eight-hour training session to CC-ARES members on a wide range of subjects, including report forms used in evidence collection, HAZMAT protective equipment use, and helicopter safety. Amateur Radio was then recognized as an ideal solution to the communication problem.

At the beginning of the drill, Clallam County Emergency Coordinator Bob Stearns, KI7ZC, was alerted by County Emergency Manager Joe Ciarlo, KC7PLL, at 2 AM to report to the emergency operating center (EOC). The EOC Amateur Radio station was activated and soon the first callouts were made to the Resource Coordinator, the Phone Tree Coordinator, and EOC station operators. The phone tree was activated to advise CC-ARES personnel to check in with the Resource Net.

Three CC-ARES operators were sent to coastal observation posts. When they arrived, they opened their packets and began composing messages. By daylight, observation posts were transmitting weather and oil spill information on the simplex tactical frequency.

At first the EOC operated at a low level of activity. That quickly changed, with the arrival of Coast Guard and Department of Ecology personnel from Seattle. The Incident Command System (ICS) is employed by the Coast Guard and the Coast Guard's Commander of the Port, responsible for the Puget Sound area, was the Incident Commander.

As personnel from participating agencies arrived, a conference center across the street from the EOC was pressed into use and various functions of ICS (Command, Operations, Planning, Finance/Administration and Logistics) set up shop. CC-ARES Resource Coordinator Ray Gilbert, K7VQF, reported to the Logistics Chief, USCG Lieutenant Kara Morrison, N6YTN. Ray set up a handheld station to coordinate CC-ARES assignments through the Resource Net Control Operator at the EOC.

A major assignment for CC-ARES was communication support for WDFW's mission, the rescue of birds and animals. Communication was required from the WDFW Rescue Operations Center at the county fairgrounds, several miles from the command center in Port Angeles, to 50 miles of beaches along the Straits. The goal was to establish a tactical link between the Rescue Operations Center, through the EOC, to the ICS Command Center and to join the Observation Post Net for immediate information about the oil distribution.

Volunteer beach teams are typically deployed only after the Coast Guard determines that a safe level of contamination exists. Teams gather birds and animals, which are sent through a primary care facility at the fairgrounds. Surviving birds and animals are transported to a de-oiling and rehabilitation facility in the Seattle area. Each Beach Team would have a CC-ARES operator equipped with mobile and/or handheld 2-meter radios that communicated through a cross-band repeater located on Mount Ellis at 3000 feet elevation.

By late afternoon of the first day, the Coast Guard determined that beaches posed a low level of HAZMAT exposure and the rescue operations could begin a day early. Beach Teams responded to reports of oil-covered birds and animals on several beaches. Teams returned by dark with rescued birds and animals.

The second day's plan called for the three observation posts to be abandoned and a site high on a mountain to be activated, serving as a cross-band repeater and observation site. This site continued to provide observation reports to the EOC and the Rescue Operations Center. From this site, a cross-band repeater linked the Beach Teams (2 meters) with the Rescue Operations Center (70 cm) at the fairgrounds.

As four Beach Teams patrolled the beaches, CC-ARES communicators provided the Rescue Operations Center with a

steady flow of statistics and status reports. Teams were directed to more active locations and they had immediate ham radio links to get help in the event of injury. This type of communication had not been available to WDFW during actual oil spills in the past.

During the 36-hour exercise, 17 CC-ARES members participated, logging more than 240 hours. A total of five nets were established. At the debriefing the next day, USCG Admiral Lockwood had great praise for the volunteers. He singled out Amateur Radio as having demonstrated again to be a great asset to the community and to responding agencies.

TRAFFIC NETS: HAVE YOU MISSED THE FUN?

By Stephen E. McCallum, W2ZBY
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Today a ham can get all the way to Amateur Extra without knowing what a traffic net is—and missing out on one of the most satisfying facets of Amateur Radio. The world of traffic handling is enchanting, with warm comradeship among traffic operators, and fulfillment of an evening spent relaying messages for fellow citizens.

The very name of the American Radio Relay League is based on message relaying. Today, message handling includes automated digital modes—and one can envision future digital networks routing messages from Earth station X to amateur satellite A to satellite B to Earth station Y.

But in the waning years of the 20th century, CW and voice modes still carry the bulk of traffic handled on today's nets. Message dispatching has evolved into an efficient format that can confuse a tyro listening to a traffic session, particularly on CW, until he learns net procedure.

The procedure saves time. Consider this situation: It's 8 PM, a week before Christmas and a net control station (NCS, for short) has 15 stations checked in, each with up to 10 holiday greeting messages for addressees across the nation. The NCS must get those messages on their way within the hour because a different net will occupy the frequency at 9 PM. There's no time for banter. Time is saved with prowords, prosignals, Q signals and abbreviations. The session starts with the NCS "calling" the net. A roll continues until no more stations check in. Now the NCS has a list of stations in tonight's net, where they are located and what messages each holds. He begins dispatching this traffic, directing stations to pair up and move off frequency to relay it.

Periodically, during the flurry of dispatching messages, the NCS will make net calls to gather additional traffic outlets. The net goes on, messages are exchanged, stations come and go—and suddenly it's 9 PM. The NCS closes the net, and relaxes with a satisfied sigh.

You'll hear a lot of abbreviating on the CW nets. For instance, you can get Net Control's attention with a single dit. He'll answer "K," or perhaps with a single dit.

You can find slow-speed nets between 3675 to 3725 kHz at night and 7100 to 7150 kHz during the daytime. Check *The ARRL Net Directory* to find specific frequencies and times. Net members encourage and train CW beginners. Listen around 3650, 3670 and 7050 kHz for high-speed nets.

Proper message form—with *Preamble*, *Address*, *Text* and *Signature*—should be used with *all* third-party traffic. You soon will learn the special prowords, abbreviations, policies and mysterious signals like WA, WB, AB and BN that abound in traffic work.

Relaying across the nation follows the National Traffic System (NTS), a pyramid organization wherein local and section nets send traffic to region nets that cover several states. In turn, region representatives report into area nets—Eastern (EAN), Central (CAN) and Pacific (PAN). The system meets in net sessions every day. Also, digital stations (including AMTOR, PACTOR and Clover) feed traffic into NTS.

Amateur traffic operators find their reward in personal satisfaction. They're a friendly bunch, all business at net time—but always ready to slow down and help a beginner. Many hams spend a lifetime at it. For something different, give traffic handling a try.

For more information and a basic booklet, the *Public Service Communications Manual*, contact ARRL's Field Services Department.

NWS WEIGHS IN ON LITTLE LEO ISSUE

In a February 18 letter to the FCC, the National Weather Service (NWS) sided with amateurs on the issue of possible introduction of mobile satellite services at meters and 70 centimeters, saying it "strongly supports the Federal Emergency Management Agency's (FEMA) position that [FCC] reject this proposal."

The NWS said that, "in fulfilling its mission of protecting the public from life- and property-threatening natural hazards, [the agency] works very closely with FEMA and the state and local emergency management infrastructure, its partners in the hazards community." The NWS said "An important element in this partnership is the work of amateur radio operators."

The letter went on to say "Amateur radio operators comprise, by far, the largest contingent of NWS-trained SKYWARN severe weather spotters. NWS field officers train and maintain contact with more than 120,000 spotters across the United States, most in partnership with the American Radio Relay League's Amateur Radio Emergency Service and thousands of local radio clubs. It is the unique combination of their ability to describe potentially or ongoing severe weather and their means to communicate instantly this information to the NWS, along with their dedication to service, that makes amateur radio operators crucial to the continued improvement in NWS warnings for severe weather and flash flooding.

"NWS modernization of remote sensors, such as Doppler weather surveillance radars, has helped to identify potential severe storms, but Skywarn spotters still provide 'ground truth' information valuable in the issuance and verification of warnings. Through the use of amateur radio communications, NWS meteorologists can have severe weather spotters accurately prepositioned and quickly redeployed as necessary. Instantaneously relayed spotter reports enable NWS meteorologists to correlate radar signatures (indicators) with severe weather occurrences, to improve warning specificity and lead time, and to learn more about storm structure and evolution to improve future warnings.

"Amateur radio operators also provide communications back-up support to NWS offices using equipment operating in the referenced frequency bands when other forms of telecommunications are inoperative, for whatever reason. This communication back-up support is critical to ensuring the continuity of NWS forecast and warning programs."

Summing up, the NWS said, "Quick and reliable amateur radio communications by SKYWARN spotters help to provide the critical information and lead time to assist the NWS in the protection of life and property. This core mission of the NWS can be seriously degraded if an allocation is made that contributes to higher noise and interference levels in the bands, resulting in the SKYWARN operators' inability to effectively transmit essential messages. We strongly urge the FCC to remove these amateur bands from consideration unless studies indicate that the allocation would not contribute to a higher noise floor, additional congestion, or interference in the band that would result in the Skywarn operators being unable to transmit messages critical to the protection of life and property."

CALL FOR ARTICLES ARRL YEAR OF PUBLIC SERVICE

ARRL Field appointees: Why do you use your Amateur Radio license, time and equipment in service to the community? What major public service events have you been involved with this year? We want to know, and we want to share your personal story with readers. Please send your stories and photos to the undersigned at ARRL Headquarters. We'll publish some of the best in a future column or feature article

—Rick Palm, K1CE

Field Organization Reports March 1997

Section Emergency Coordinator Reports

There are 40,113 ARES members accounted for in SEC records. The following section emergency coordinators reported: AL, AZ, CO, ID, IN, MDC, ME, MI, NFL, NLI, NV, PAC, SD, TN, VA, VT, WMA, WVA.

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle 2						
Area Nets						
EAN	30	651	21.70	0.650	93.3	
CAN	31	438	14.13	0.420	100.0	
PAN*	62	407	6.56	0.380	93.5	
Region Nets						
1RN	62	609	9.82	0.687	98.0	100.0
2RN	62	344	5.55	0.489	98.9	100.0
3RN	31	134	4.32	0.390	100.0	90.0
4RN	62	337	5.44	0.300	76.0	100.0
RN5	62	568	9.16	0.335	83.0	100.0
RN6	28	25	0.89	0.225	64.0	96.7
RN7	62	595	9.60	0.420	73.9	100.0
8RN	56	250	4.46	0.464	98.9	93.3
9RN	56	373	6.70	0.570	87.0	100.0
TEN	62	580	9.35	0.799	51.0	100.0
TWN	56	259	4.62	0.470	62.6	83.8
ECN						76.7
RN6 Digital mailbox traffic: 599						
Cycle 3						
Area Net						
EAN	31	216	6.97	0.498	88.0	
Region Nets						
1RN	31	78	2.52	0.318	92.2	100.0
2RN	30	86	2.87	0.379	98.9	83.5
3RN						100.0
4RN						77.4
8RN						93.5
ECN						96.7
Cycle 4						
Area Nets						
EAN	31	993	32.03	1.268	97.2	
CAN	31	549	17.71	1.017	100.0	
PAN	31	474	15.29	0.698	90.3	
Region Nets						
1RN	61	223	3.65	0.411	94.0	100.0
2RN	62	198	3.19	0.390	99.3	96.7
3RN	45	169	3.76	0.300	80.4	100.0
4RN	62	685	11.04	0.609	78.3	96.7
RN5	62	648	10.50	0.653	96.3	100.0
RN6	62	244	3.94	0.512	88.0	100.0
RN7	58	357	6.15	0.557	91.1	100.0
8RN	53	314	5.92	0.360	78.0	100.0
9RN	62	282	4.54	0.762	92.0	100.0
TEN	62	272	4.39	0.459	78.0	100.0
TWN						71.0
ECN	31	79	2.54	0.308	88.0	83.8
ARN	31	35	1.12	0.320		100.0

*PAN operates both Cycles 1 and 2.

ARRL Section Traffic Managers reporting: AL, AR, AZ, CO, CT, DE, EMA, ENY, EPA, EWA, GA, IA, ID, IL, IN, KY, LA, MDC, ME, MI, MN, MS, NC, NFL, NH, NNJ, NTX, NV, OH, OK, OR, ORG, RI, SB, SC, SD, SDG, SF, SFL, SNJ, STX, SV, TN, VT, WI, WMA, WNY, WV, WWA.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle 2				
TCC Eastern	93	75.00	253	515
TCC Central	121	97.50	507	516
TCC Pacific	112	90.32	399	907
Cycle 3				
TCC Eastern	31	100.00	n/a	48
Cycle 4				
TCC Eastern	103	98.10	205	729
TCC Central	57	91.90	216	442
TCC Pacific	111	90.00	309	692

NTS Digital Traffic Total: 7361

TCC Roster

Eastern Area, Cycle 2: KW1U, Director. N1DHT W1FYR KF1L N1OTC KT1Q KW1U W2FR KA2GJV N2LTC W2MTA KA2VZX N2XJ KA2YZM N3EFW N4ABM AA4AT WX4H WD4MIS K4MTX N4SS K8TPF WD8V KA8WNO WB8YDZ.

Eastern Area, Cycle 3: W2FR, Director. N1OTC W2FR W3OKN AA4AT K8TPF KA8WNO.

Eastern Area, Cycle 4: W2FR, Director. KF1L KT1Q KW1U N1FT N1OTC W1CE W1FYR W1NJM KA2GJV KA2VZX N2JAW N2LTC W2CS W2FR W2GKZ W2MTA W2RQ WB2EAG N3DRM AB4E K4SCL K4WJR N4GHI N4SS W4UQ WB4KSG N6ANQ K8TPF KA8WNO W8JWX W8PMJ W8UQ WB8YDZ WD8V VE3AWE VE3FAS.

Central Area, Cycle 2: N***FBW, Director. W4ELS W5JDF N5IKN W5KLV K5MXQ KS5V W5YQZ KE5ZV WD8LDY NØFBW WØFE WBØWNJ.

Central Area, Cycle 4: K5GM, Director. K5GM W5JDF K5RG W5TFB KS5V KB5W WD8LDY N9CK W9FC K9PUI WA9QCF NØSM.

Pacific Area, Cycle 2: KT6A, Director. KT6A W6DOB AB6EU N6GIW KF7AG W7TGU N7UOF K7VVC KA7YYR.

Pacific Area, Cycle 4: W7GB, Director. W6EOT W6QZ W6VZT K6YR WA7EES KA7EKL W7EP W7GB W7GHT KB7GZU NN7H W7LG W7VSE W7ZIW K9JM KØEZ KØTER VE7CTW VE7DWG.

NTS Digital stations: W1FYR N1NNM N2AKZ WB2FTX N2JAW N2LTC KA2VZX W4BNY AD4DO KQ4ET WX4J W4KAU N4SS K5DPG K5MXQ W5YQZ WB5ZED WD8LDY N9ANL W9CBE NØFBW NØZO VE3BDM.

Public Service Honor Roll

This listing is to recognize amateurs whose public service performance during the month indicated qualifies for 70 or more total points. Point categories are explained in last month's PSHR column in *QST*.

855 NM1K
741 KE4PAP
497 N5NY
441 KC5QGI
406 KE4AZL
394 KT1Q
371 KA2ZNZ WD8V
347 KE4YXW
324 K4FQU
300 KC5OZT
274 KA2VZX
265 K4SCL
258 N1DHT
244 N2DB
242 N2WFN
239 KF9AS
237 K5MC
236 WB2UVB
232 KA5TTO
231 KE0AH
228 KB5RUG
223 K7BDU
215 WA1TBY
210 KB7JQM
209 W6DOB KØIBS
204 KA2YZM N2YJZ
201 WB4GM N5NAV
198 K2DYB AA2CX
195 K6YR WA9VND WX8Y WØOYH
192 KR4MU
190 WA2SEI
189 W7TVA
187 KA4FZI
184 KC5QZZ
183 N2LTC
180 W9YCV K2GNZ WØNBT
178 K9FHI
176 WB4TVY N1LKJ
175 N2AKZ
174 KB5GLV N2MSM
172 K5DPG KD4GR
171 W5YQZ W2HOB
170 KC4RNF KL7Q K7VVC
169 AD4DO W4BNY
168 W6IVV KE4DNO KA2GJV WA1JVV KS5V W7WAT
165 AB6EU N2FHJ
164 KØTQ WA2CUW
163 N2RPI W9CBE KT4TOK KD4SIV WBØZNY KK1A
162 N4TRX KA4HHE
161 KA1JXH NØKJ
160 WB2ZIE
159 N1OTC
158 AAØOM
157 N1VXP N3PGG KB2KLH KO6RZ
156 NR2F NY2V WB2ZCM
155 WB1GXM KA2CQX
154 W3YVQ W5IQZ WB5NKC K2DN
153 NØUOD WX4H W4AET
152 N2OWN
KB2LUO
151 AE4EC KA9EIZ
150 WB5ZED N1SGL
149 N2OPJ N2WGF WA1FNM
148 NZ4O KC4ZHF N8FPN W6QZ
147 WD9FLJ
146 WD4MIS
144 KB2CDB
143 AF2K WD5GKH
142 AA4HT AD4BL W2MTA KF1L WØLAW W7KDB KT1Q W5RZV
141 N4GHI N2JBA
140 NX1A K2BCL KT6A
139 WB9TUS WØOTF WA4NDA KB2TIY KD1LE
138 W1KX KE4KET N8DD N3DRM N9BDL W7ZIW
N4JAQ KB2WYE W8IMX WD8DHC N1KPT W7GB
137 KK5ST K4RBR
135 WB2CZW N8IXF KC5NEZ KG2D
134 KA1GWE N2XJ N1CPX K6AGD
133 AF4NC N8FWA
132 KA9KLZ WI2G AA2SV
131 N9MN K4MTX
WA4EIC WAØTFC
130 KI4YV NN2H
129 W9UMH W9RCW W7LG KA7TTY
128 AA9HN WNØY N2VQA N5IKN N8RBE N7UOF
127 W4DLZ WA8DHB K5TF
126 KE6MIW K3JL W5ZIN
125 K4IWW KA1VEC KE2JX KD4PWK WB4LJU WD4EKA WX4J
124 KE4JHJ KA1WCD
123 WB5CDX W4PIM WBØWNJ
122 N3WKE KJ3E N2GJ KA7AID
121 N2OJI N5OUJ
120 AA4AT NR9K KB2UKF W7GHT K7GXZ
119 N2SSS
118 WA4QXT WB8KWD KB5TCH W4CKS AE4UB WB2QIX KA8WNO W7VSE
117 W4DGH
116 K1TPK WI8K W1PEX
115 N2TQN KC6SKK
114 N2FM W5MEN WDØGUF AD4KA
113 KD7ME N2XOJ
112 KG5GE AG9G W8JWX W1ALE
111 W4OGG KA4LRM
110 KC3Y K3GHH KT4SJ WU4C
109 W2MTO W4FBE KB2UQZ N1DHT W7EP
108 K9GBR KØERM KC2ANQ KD4TQN KB9ENO N9KHD KØPIZ WB5YDD
107 K4VIA KD4OGV W7NWP
106 KU4DZ WA8SSI KB8ROA KA4UIV
105 AA2NX
104 N8JSO
103 W4JLS KE4IFD N1IST W5CTZ
102 KG6TU N4GMU W2FR N2ZMI
101 KB2KOJ WA2UKX KD4FQG
100 N3RB AE4KX W2PII
99 WA0YJX KK3F KE3OX AA2ED N6GIW KE4NAY
97 KA8MPD KA2DBD N5BMB
96 AE4WP W4XI NZ1D
95 K4AIF WA1CSO WY3K
94 KE4HFX WB4PAM WB2IJH N5JUU
93 W1JTH AE4EF K4VHC
92 KB4MON W7VNT W8UQ
91 KG7LS KB2ETO KA1VAX N8TDE
90 KK6NQ KE4W W2AZ
89 WD4ZNB
WJ3K WA4EYU AA8PI
87 N1TDF
86 KB2OPJ KK5WG WA5FXQ KB5UCQ
85 WØMZI
84 N1HYF WA1QAA N3MPV W7PFD KB2WII N1VUX W7UVP
KB0DTI
83 WA6DQK W2CC K5WOD KE1CN
82 KB2YSJ KA9FVX
81 KN4US KO4OL KD6YJB
80 WA4GLS KB2GEK WB8BGY
79 KD4JMA
KR4ZO
78 K7MQF N6FWG
77 WB5CXK
76 K8IG
75 KD4JMV
74 KC5WEG
73 KU4CE NY8V W4RRX N2AYK
72 N2SU
K8WC W4NTI AJ4Y KB2VSD N2FHK N2SOE KB2HJJ
71 N4JTG W2JG N2ZMZ N1VBH
70 KC5DRS KB4WBY KB2YSI KA1OTN KB2VSR KB2YBM

The following stations qualified for PSHR during February 1997, but were not listed in last month's column: KC5OZT 134, KE3FL 74, N4MM 71.

Brass Pounders League

The BPL is open to all amateurs in the US, Canada and US possessions who report to their SMs a total of 500 points or a sum of 100 or more origination and delivery points for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL radiogram format.

Call	Orig	Rcvd	Sent	Dlvd	Total
W1FYR	2	1063	1076	3	2144
WX4H	10	1021	1007	5	2043
AB7NK	0	1853	154	0	2007
NM1K	735	270	845	6	1856
W9IHW	3	1073	43	732	1851
WB9JSW	0	987	36	575	1578
WBØWNJ	0	259	1205	5	1479
KE4PAP	494	157	574	157	1382
W3CUL	372	615	245	39	1271
N3PGG	0	310	942	3	1255
N1OTC	0	585	639	1	1224
W3VR	271	335	391	59	1056
W5YQZ	1	504	509	12	1026
AAØOM	1	458	537	9	1005
WA9VND	27	501	455	15	998
N5NY	—	—	—	—	982
N2LTC	1	444	485	14	944
W1PEX	1	711	221	2	935
NØDKK	31	474	0	404	909
K7VVC	32	410	452	6	900
KK5QT	31	418	449	0	898
WØWPD	31	472	65	286	854
K7BDU	99	352	379	16	846
KE4DNO	24	293	514	6	837
N5NAV	1	453	305	2	761
W3KOD	1	420	326	4	751
K4DOR	181	192	363	10	746
KA2ZNZ	130	263	247	93	733
KA2VZX	41	320	307	55	723
NØJUS	31	326	0	326	683
KT6A	5	362	276	7	650
K4SCL	80	234	285	47	646
N4TRX	34	274	324	10	642
K4FQU	185	143	284	23	635
W6DOB	5	264	297	56	622
KE4AZL	99	209	114	193	615
N3DRM	8	350	318	22	606
WØLVI	16	318	77	183	594
N4GHI	0	334	252	3	589
NØKJ	18	267	264	21	570
KE4YXW	19	255	28	238	540
KA1VEC	10	231	255	31	527
WB5NKC	18	201	278	28	525
KA2YZM	25	244	217	31	517
AA2CX	12	272	202	18	504

BPL for 100 or more originations plus deliveries: KE0AH 150, KØIBS 132, K5MC 130, W7AMM 125, N2DB 106.

Independent Nets

Net Name	Sess	Tfc	Check-ins
Amateur Radio Telegraph Society	31	307	460
AmateurRadioTelegraphSociety(20M)	31	22	125
BEARS of Manchester	31	299	453
Central Gulf Coast Hurricane Net	31	45	2277
Clearing House Net	31	89	240
Empire Slow Speed Net	30	129	385
Green Mountain Net	26	36	908
Hit and Bounce Net	31	482	630
Hit and Bounce Slow Net	31	172	424
IMRA	25	559	1213
Midwest RTTY Net	31	187	424
Mission Trail Net	31	83	982
NYSPTEN	31	50	398
Pennsylvania Phone Net	31	126	255
Southwest Traffic Net	31	204	1429
Sunbelt Service Net	31	57	2996
West Coast Net	31	30	213
20 Meter ISSBN	23	191	415
75 Meter ISSBN	31	181	1054
7290 Net	47	739	2922

The World Above 50 MHz

Emil Pocock, W3EP*

Two-Meter Challenges

What is more difficult than earning 2 meter VUCC, WAS, or even DXCC? More than 500 stations have worked the 100 or more grids needed for a VHF-UHF Century Club certificate on 144 MHz. More than 100 stations have also earned Worked All States on 2 meters! More difficult is making contact with 100 countries necessary for the coveted DXCC award, yet nine stations have done even that on 2 meters. So what could be more difficult than any of these feats?

48 States Without EME

Just four stations have worked the 48 contiguous United States without resorting to moonbounce. Ed Gray, WØSD, was the first to accomplish that 18 years ago. Table 1 shows all four who have accomplished this difficult goal, with the date, state and station worked for the last state.

Table 1—Stations that Have Worked 48 States on 144 MHz Without EME

Call Sign	*State*	*Date*	*48th State*
WØSD	SD	1979 Aug	ME (K1WHS)
K5CM	OK	1980 Dec	OR (WB7TYU)
WØEMS	NE	1981 Aug	VT (K9AKS/1)
WQØP	KS	1993 Aug	OR (W7XU/7)

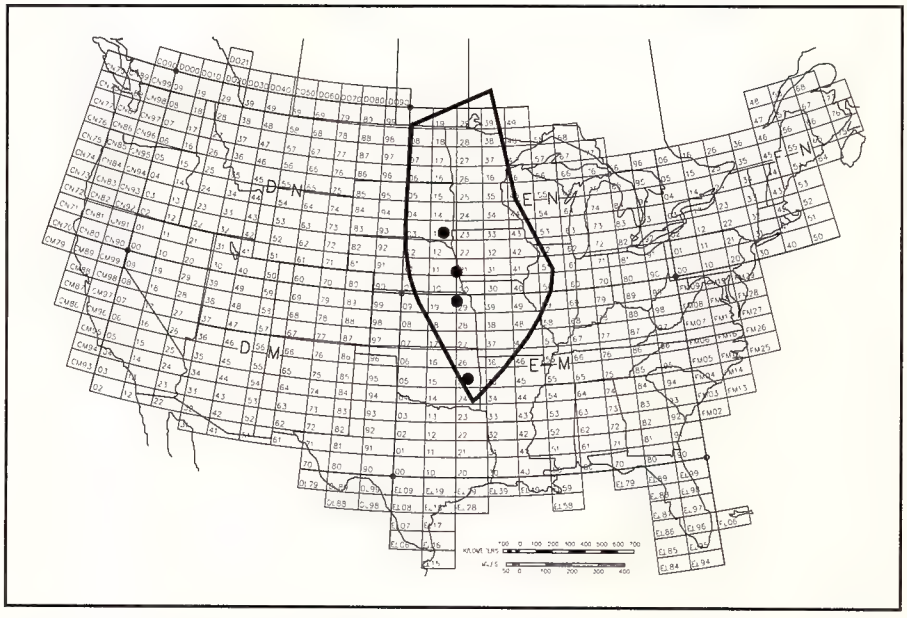

Figure 1—The outlined area lies within 2300 km (1400 mi) of all 48 states. The western side is 2300 km from the most westerly borders of Maine and Rhode Island. The eastern side is limited by the critical distances to California, Oregon and Washington. Florida limits the northern boundary. Dots show the locations of the four stations that have made contact with all 48 continental states on 144 MHz without resorting to moonbounce.

The table suggests several curiosities about working 48 states by terrestrial means of propagation (tropospheric ducting, aurora, sporadic E and meteor scatter, primarily). Stations located in the Midwestern states from South Dakota to Oklahoma seem to have an edge. Why this should be so will be evident further on. Note that the last state worked in each case is on one coast or the other, perhaps expected for stations in the center of the country. Finally, the dates suggest that the 48th-state contacts were made during one of the two great meteor showers—the August Perseids or the December Geminids.

Why should the Midwest be favored? There is a relatively small region in the country (outlined in Figure 1) that is within 2300 km of all 48 states. This distance is the normal maximum for E-layer propagation modes, including meteor scatter, aurora, and sporadic E. Check this month's standings boxes and note the best DX for the leading stations. Many fall in the 2300 km range. Even though exceptional contacts are made by terrestrial means over 2300 km, they are rare. Thus those stations within this distance of all "the lower 48" states have a distinct advantage.

Contacts longer than 2300 km are made from time to time using terrestrial means. West Coast stations work Hawaii in the 4000 km range via ducting almost routinely each summer, but 2000 km is still unusual over the continent. There have been only a few documented sporadic-E openings with contacts longer than 2300 km. QSOs that involve meteor scatter in excess of 2300 km are exceedingly unusual, but unlike the other possible DX modes, meteor scatter is predictable.

This is probably what makes meteor scatter the most common and popular way to eke out the last few states. The great annual meteor showers provide excellent opportunities, if you have some patience and set up appropriate schedules. Meteor-scatter work also does not require a fancy station. A single Yagi and 150 W is usually sufficient, especially for carefully coordinated, scheduled sessions. All four of those who have worked 48 states have relied on meteor scatter.

So who will be number five on the list? Jim Roseman, W9UD (EN41), has been poised at 47 states for some years now and needs only California. Jim is just within 2300 km of Southern California. Several other midwestern stations are also within reach. Perhaps someone would be willing to set up a portable station in the Needles area (DM24) and run meteor-scatter schedules with W9UD and other stations that need California this August. Two of the four fortunate stations worked their 48th state thanks to portable operations and meteor-scatter contacts. Someone out there could help make a bit of history.

Worked All States

All of the 129 stations around the world that have worked all 50 states have relied

This Month

June 7	Artieds Meteor Shower Peaks 0900
June 14-16	ARRL June VHF QSO Party
June 21	UKSMG Contest
June 21-22	SMIRK Contest

*Send reports to Emil Pocock, Box 100, Lebanon, CT 06249. Leave voice messages at 860-642-4347, or fax 860-594-0259 or e-mail **w3ep@arrl.org**.

144 MHz Standings

Two-meter band standings are compiled each April 1 for publication in the June issue. Stations must work at least 10 states for inclusion. To be included in this list, you must have submitted information within the previous two years. You need not work additional stations to remain in the standings, but please confirm your continued interest. You can submit data by e-mail to **standings@arrl.org**. Send paper submissions to Steve Ford, WB8IMY, ARRL, 225 Main St, Newington, CT 06111. New reporting forms are available from the same address with a self-addressed stamped envelope.

Call Sign	QTH	States	DXCC	Grid Squares	Best DX (km)
W1JR*	MA	50	23	198	2304
AF1T*	NH	50	28	—	2240
K1FO*	CT	50	—	98	—
K1GVM*	MA	50	28	—	2282
W1AIM*	VT	47	11	167	2092
K2LME/1*	CT	42	25	145	2462
WZ1V	CT	38	9	257	2700
KD1DU*	CT	36	7	155	2344
N1AIS	MA	34	4	43	2380
W1REZ*	ME	34	7	170	2491
WA2TEO/1	CT	32	3	181	2180
W1RIL	MA	32	3	96	2314
W3EP/1	CT	32	3	135	2450
K1VYU	CT	30	1	130	2340
WA1LOU	CT	26	3	46	2219
N1LZC	MA	22	2	59	2095
N1FUS	MA	17	3	47	—
K1WVX	CT	15	2	40	1093
K2OS*	NY	50	34	200	2133
N2WK	NY	40	3	194	2298
NB2T	NY	39	2	64	2030
KE2N	NY	38	4	151	2735
W2UAD	NY	38	3	130	2315
WB2CUT	NJ	37	2	141	—
W2MPK*	NY	36	8	—	—
K2OVS	NY	36	4	103	2800
N2DKP	NY	34	2	108	—
WV2C*	NY	32	12	130	—
KU2A	NY	31	2	113	2117
WA2BAH	NY	31	3	100	2010
WB2VVV*	NJ	26	6	92	2080
W3HHN/2	NY	24	2	68	2024
W2WW	NY	24	3	—	—
KA2MCU	NY	23	2	63	2010
WB2DUS	NY	14	2	28	1120
WA2ZFH	NY	12	1	21	600
KB3PD*	DE	50	2	162	—
K3VGX*	PA	50	4	102	—
WA3HMK*	PA	50	59	388	—
W3ZZ*	MD	38	5	233	2538
KA3KHZ	DE	37	2	148	2087
AE3T	PA	37	3	—	2510
K3KEL	PA	35	2	116	2120
W3BO	PA	35	3	113	2090
WA3DMF	MD	32	4	59	2050
K3EAV	PA	31	2	—	2400
WA3BZT	DE	25	2	64	1805
KH2CY/3	MD	25	2	86	2175
K3UA	PA	24	3	90	1650
N3JNX	PA	15	2	35	975
WB4JEM	FL	40	7	188	2226
K4MRW	AL	40	4	245	—
WS4F	GA	40	3	208	2147
WD4AFY	GA	39	3	191	—
WB4DBB	VA	39	5	190	2600
WD4AHZ	FL	37	7	214	2485
NA4I	GA	37	3	155	2413
N4KWX	VA	35	4	156	2158
WD4MGB	FL	34	8	148	2180
K3ICH/4	VA	34	5	—	—
KC4QWZ	TN	34	3	154	
KD4UPF	VA	34	2	111	2023
N4MM	VA	33	5	133	—
AA4H	TN	32	2	141	1949
K1FJM/4	FL	30	7	124	—
WD4O	VA	13	1	35	858
W5UWB*	TX	50	25	—	—
K5YY*	AR	50	30	452	2510
WA5VJB*	TX	50	19	—	—
W5RCI*	MS	50	19	256	—
WB5IGF*	AR	50	37	305	2850
WB5LUA*	TX	50	—	—	—
N5KW*	OK	50	—	—	—
K5SW	OK	47	5	278	2269
W5FYZ	LA	44	4	253	2390
W5VY	TX	44	6	225	3070
W5AL	TX	42	4	276	2210
W5SXD	TX	41	—	—	—
N5BBO	TX	36	4	113	1723
N7JJS/5	LA	35	4	169	—
AA5C	TX	34	1	151	2202
WA5IYX	TX	32	2	110	2243
KB5EK	OK	32	1	126	2025
N7JJS/5	LA	31	2	149	—
W5OZI	TX	24	2	135	2268
W3XO/5	TX	22	2	119	2170
N5QGH	TX	19	—	81	—
K6AAW*	CA	49	24	199	3821
K6QXY*	CA	23	8	—	3794
KB6IGC*	CA	22	13	105	—
K1FJM/6*	CA	22	8	76	—
N6RPM	CA	15	2	62	3970
N7STU/6	CA	12	3	62	1849
K6KLY	CA	12	4	—	3276
W7HAH*	MT	50	80	433	3027
WA7KYM*	WY	49	26	187	2359
NC7K*	NV	30	16	150	4056
NJ7A	UT	24	3	108	1992
N7MWV	WA	11	2	61	4321
KU8Y*	MI	50	23	271	1891
K8BHZ*	MI	50	33	305	2255
N8DJB	OH	41	5	251	—
WA8NPX	OH	36	2	150	—
W8QXO	OH	34	1	—	2092
K2YAZ	MI	34	2	144	2070
N8KOL	OH	31	2	107	1502
NQ8A	MI	25	2	77	1609
N8VEA	OH	24	2	83	2223
N8ZJN	OH	23	2	81	1570
W9UD	IL	47	—	200	—
N9AQ	IL	43	1	235	2269
NØAKC/9*	WI	45	13	157	2150
WØUC/9	WI	40	2	187	2052
WA9LWJ	WI	39	2	188	1932
KD9PW	WI	38	3	—	2500
K9SM	IL	37	2	119	1791
W9YCV	WI	37	1	160	—
KD9TH	WI	36	2	137	2018
WB8YFE/9	IN	33	4	156	2486
AA9AO	WI	27	2	117	1600
KA9UZW	WI	25	2	95	1678
WA9PWP	WI	25	2	118	1400
N9LAG	IL	22	3	76	1781
WD9IAB	WI	20	2	53	1400
KE9QT	WI	14	2	48	1350
KBØHH*	KS	50	1	253	—
WØHP*	MN	50	70	—	—
WQØP	KS	48	—	200	—
KØDAS*	IA	48	4	159	2240
KMØA*	MO	47	9	376	2780
NØLL	KS	46	2	346	2378
WAØBWE	MN	46	2	165	2570
WØOHU	MN	45	2	73	2040
KØCJ	MN	44	2	—	2330
WØIZ	IA	44	2	220	2384
KØTLM	MO	44	2	221	2066
WØDFK	MO	43	3	219	2320
WØRAP	IA	41	2	108	2307
KØUS	NE	40	—	132	—
NTØV*	ND	39	7	165	2120
KAØKUY	KS	39	2	175	2275
NØHJZ	MN	37	2	151	2414
KBØZQ	MN	37	2	166	2610
WØJRP	MO	36	3	201	2150
KDØPY	IA	36	1	186	2174
WØKEA*	CO	35	6	206	2200
KBØIKP	MN	26	2	113	2253
KRØI	MO	24	1	82	1595
KØRZ*	CO	24	2	88	2390
NØSWV	CO	14	1	56	1200
VE1ALQ*	NB	50	48	192	—
VE3AX*	ON	45	22	—	2225
VE3KDH*	ON	44	8	175	1985
VE6TA*	AB	42	25	170	2425

—Information not supplied
*Includes some EME (moonbounce) contacts

on moonbounce for some, or all, of their contacts. KØMQS claimed the first 144 MHz DXCC in December 1976; WQØP was the most recent addition to the list in January 1997. Many stations in the United States and adjacent Canada have worked at least 40 states via terrestrial means. Working 10 additional states by EME may not be as difficult as it seems.

Under ideal conditions, a single-Yagi station with at least 500 W can make EME contacts. Even smaller stations have done it. This usually requires a station with at least four Yagis on the other end and a time when the moon is on the horizon for one or both stations. One practical difficulty is that there are few stations in Hawaii, Alaska and other of the most-sought-after states, so scheduling might be a problem. Still, 50 states may actually be well within the capabilities of many more stations.

DXCC

Nine stations (and just four of them in the US) have worked 100 countries. See Table 2. This goal does require EME and a good station at that. Dave Blaschke, W5UN, was not only first, but he continues to lead the pack of EMEers. Dave now has 144 countries to his credit and has made contacts with 2200 different stations! All this is helped a good deal by his 48 Yagi array—an antenna so large that Dave is able to make QSOs on a routine basis with stations running as little as 150 W and a single Yagi. If you have not made an EME contact and want to give it a try, call Dave.

Table 2—144 MHz DXCC Holders

Call Sign	Date Issued
W5UN	1991 Jan 11
KB8RQ	1992 Oct 28
SM7BAE	1993 Jan 4
VE7BQH	1994 Jan 5
HB9CRQ	1994 Sep 6
I2FAK	1995 Mar 17
WB5LBT	1995 Jun 8
DK3WG	1996 Jun 30
K1MNS	1996 Jul 22

KB8RQ has an impressive 130 countries and contacts with about 1325 different stations. He is helped by his 24 Yagi array. Just as astonishing is the work done by PAØJMV. Using just two Yagis, but with patience, excellent operating skills and an optimized station, he has worked 94 countries and about 500 different stations—including others with just two Yagis. You, too, can start on your own route to 100

countries more easily than you might have thought.

VUCC and 200 Grids

More than 500 stations now have 144 MHz VUCC certificates for confirmed contacts with 100 grid locators—which is astonishing, really. Several dozen have more than 200 grids to their credit. Is this goal beyond the reach of all but moonbouncers? Not at all. Quite a few Midwest, and even East Coast, stations have tallied 200 grids without EME. More than 500 grids are within reach of an ideal location in the central US. Locations near each coast may not have as many land grids within reach, but many operators have augmented their totals by working maritime stations in all-ocean grids.

The VUCC program does not make any distinctions on propagation mode, so more than a dozen EME-capable stations already have 300 or more grids to their credit. Unlike WAS or DXCC, VUCC offers over 40,000 grids—enough to last a lifetime, or two!

ON THE BANDS

Activity reports were a bit thin for March. The leading news for the month was not sporadic E (only one opening was reported), but rather the eight days of 6 meter transequatorial propagation around the world. Aurora appeared on one day and tropospheric ducting was in evidence across the Southern US on two additional days. That's it! Dates and times are UTC.

Transequatorial Propagation on 50 MHz

Transequatorial field-aligned irregularities (TE) represent an F-layer phenomenon that appears around the spring and fall equinoxes. The several days of reported TE in March created a bit of excitement around the world, as 6 meter operators become ever eager for any signs of real F-layer openings. Nearly all TE openings occur in late afternoon and early evening, so times have been omitted from the following reports. Thanks to JA1VOK for some of the data.

The current series began at the end of February. LW5EJU made contacts with KP4EIT and KP4O on February 27, and heard XE, V4, and YV beacons. Here are the summaries for March:

Date (Mar)	*Notable Contacts*
2	KP4-LU, JA-VK4
3	KP4-LU, JA-VK4
4	JA-VK4
12	JA-VK4
15	JA-VK4,6,8
16	KP4-PY, LU
26	IKØFTA-V51VHF/b
27	4Z5JA-V51VHF/b

Sporadic E

The lone day with sporadic-E activity came at the end of the month—March 30. Six meter contacts were primarily over north-south paths across the Rocky Mountain West for an hour after 1800. By the time you read this, 6 meters will be opening more often. Remember to move up to 50.200 MHz for domestic contacts!

Aurora

Mark Dzuban, KB2IT (FN20), had good success on 2 meters with the aurora that began on February 28. Between 2320 and 0005 the next UTC day, he hooked up with VE3MAL (FN06), N4PZ (EN52) and four others. Mark found two other stations to work around 0525, when the aurora returned.

Darryl Petersen, KDØPY (EN41), had good luck a month later with the session of March 28. He found a number of stations in western New York after 2300 and worked as far east as WZ1V (FN31). He heard K4QI (FM06) as the southernmost station that appeared in these reports, but could not raise him.

Tropospheric Openings

Springtime usually means tropospheric ducting across the Gulf and the lower South. Two rather ordinary openings led off this year's tropo season. K4MRW (EM64) in northern Alabama found 2 meters open to southern Louisiana and adjacent Texas after 1230 on March 4. Conditions were also good on the 23rd after 0600, when N5PIP (EL96) worked KB5IUA (EL29) on 2 meters.

VHF/UHF/MICROWAVE NEWS

SMIRK Contest

The Six Meter International Radio Club holds its annual contest for the 48 hour period from 0000 June 21 until 2400 June 22. Exchange grid locator and SMIRK membership number, if you have one. Only contacts with stations outside the US and Canada are allowed within the 50.100-50.125 DX window. Score 2 points with each SMIRK member and 1 point for all other contacts. Double the point value of your voice-only (SSB) contacts made above 50.200 MHz. (Only one contact may be counted with each station, regardless of mode or frequency.)

Final score is total points times number of different grid locators. Send logs and summary sheets to Pat Rose, W5OZI, Box 393, Junction, TX 76849. Log forms can obtained from W5OZI with a large SASE or downloaded from the Web at **http://www.cswnet.com/~ka0nno/PAGE%205.htm**.

UKSMG Summer Contest

The UK Six Meter Group holds its annual contest for the 24 hour period of June 21 UTC. This 50-MHz-only contest is open to the entire world. Exchange call sign, RS(T), UKSMG membership number (if you have one), and four character grid locator. Work a station once regardless of mode.

You need not be a member to participate. Single operator, multiop stations and portable operations are all eligible for awards. All QSOs within one's own continent must take place outside the 50.100 to 50.120 MHz DX window recognized in Europe. Use of packet radio DXclusters is permitted, but self-spotting to solicit contacts is not.

Score 2 points for contacts with UKSMG stations and 1 point for all others. Final score is total points times DXCC countries times different grid locators. Send summary sheets, logs and separate lists of grid locators, countries and UKSMG membership numbers to David A. Whitaker, Hillcourt, 57 Green Ln, Harrogate, North Yorkshire HG2 9LP, UK, no later than July 22.

June 21 is likely to be a hectic day for worldwide 6 meter activity, as two contests will run simultaneously. There is no reason why exchanges cannot meet the requirements of both. Americans ought to closely watch the entire band for Europeans, as there will be hundreds of stations on the air for this event. Try to find a quiet place below 50.125 to nab the Europeans!

Silent Keys

Ed Tilton, **W1HDQ**, the founder of this column (58 years ago) and the inspiration for several generations of VHFers, died this past March 1 in Florida. His loss saddens all of us. Please read the tribute to Ed in this month's "Happenings" and the story in this column for December 1995. We must also note with much sorrow the recent passing of several other VHFers. They include the following: Tiago Frederico, **CT1WW** (October 1996), who gave many Americans their first Portuguese contact on 6 meters. Richard Diamond, **G4CVI** (January 1997), an active European VHF/UHFer often heard on this side of the Atlantic on 50 MHz and participant in the expeditions to 8R1, 9M6, and V31 associated with the Camel Trophy. Dennis Mungham, **VE3ASO** (March 1997), active on the VHF bands for more than 35 years, avid contester and organizer of the VE3ONT EME exploits with the 150 foot Algonquin Radio Observatory steerable dish. Roy Brady, **W6UXN**, who started his 6 meter operating career soon after the band opened in 1946. All will be missed. (Thanks for kind notes from VE3AX, W3IWU and GJ4ICD.) QST

VHF/UHF Century Club Awards

The ARRL VUCC numbered certificate is awarded to amateurs who submit written confirmations for contacts with the minimum number of Maidenhead grid-square locators (indicated in *italics*) for each band listing. The numbers after call signs refer to endorsements. The totals shown are for credits given from February 8, 1997 to March 27, 1997. The VUCC application form, field sheets and complete list of VHF Awards Managers is now located on the **WWW** at **http://www.arrl.org/local/info/msd/**.

Please send an SASE for the current rules, application form, field sheets and the list of the VHF Awards Managers in your area. VUCC replacement certificates for vanity call sign changes are available for $10 each. VUCC lapel pins are available for $5 each.

Compiled By Bill Moore, NC1L, Century Club Supervisor

50 MHz

100

867	WZ2O
868	AE4TC
869	N1OWA
870	KR4M
871	K8PT
872	N2VBK
873	KB9KRU
874	N3VIS
KMØA	675
N1OWA	125
K1GAO	150
WA2ZNC	125
N2MSS	175
WZ2O	200
N2VBK	150
N3VIS	125
KA3JWJ	150
WB4OQX	400
KB4CSE	450
KC5EPL	150
K8PT	125
KB9KRU	125
N9NJS	250

144 MHz

100

KMØA	375
W7HAH	425

432 MHz

50

267	VE6TA
268	KØDOK
WØJRP	90
KB4CSE	70
W4VHF	80
W7HAH	160

902 MHz

25

24	KE8FD

1296 MHz

25

VE6TA	30

10 GHz

5

94	N2RDN

Satellite

100

67	VE6ITV
W1NU	600
W2HG	175
N5JGK	175
K8TL	275

QST

CITEL Reinvents Itself

The Inter-American Telecommunication Commission (known by the Spanish acronym CITEL, pronounced "see-tell") was once a quiet little "conference" of the Organization of American States (OAS) headquartered in Washington, DC. The term "conference" meant that it existed only when in session, and not in between meetings. To become a permanent organization, it adopted a new statute and regulations, roughly equivalent to a constitution and bylaws, at the CITEL Assembly in 1994, which were later approved by the OAS General Assembly. It had become evident that the Americas needed a regional telecommunications organization that could meet the challenges of new technologies and of a fast-moving regulatory environment—with ITU World Radicommunication Conferences (WRCs) scheduled every two years well into the next millennium.

The 1994 Assembly approved the participation of industry as associate members. It also approved expansion of CITEL's secretariat in Washington, now headed by Executive Secretary Roberto Blois Montes de Silva.

What started in 1994 as some ideas on paper has grown into a functioning organization, albeit with some growing pains. At the April 1997 meeting of Permanent Consultative Committee III (Radiocommunications) (PCC.III), in Cartagena, Colombia, there were no less than 40 associate members from 9 countries as well as official delegations from 14 countries.

The interests of Amateur Radio were represented by two delegates: IARU Region 2 Secretary Pedro Seidemann, YV5BPG, and ARRL Technical Relations Manager Paul Rinaldo, W4RI. Pedro was there representing IARU Region 2, an organization long accepted as an observer at CITEL meetings. Paul was a member of the United States delegation.

The new chairperson of CITEL PCC.III, Salma Jalife of Mexico.

Before going to Cartagena, we had heard that PCC.III Chairman Luis Manuel Brown Hernandez (Mexico) had been replaced as chairman by Salma Jalife (a lawyer in charge of international affairs in Mexico's telecommunications organization). Brown, a longtime friend of Amateur Radio influenced by the performance by amateur operators after the Mexico City earthquake, has moved to private industry. We look forward to working closely with Dr Jalife in her new role.

Pedro and Paul were at Cartagena, not only to observe, but to introduce papers dealing with Amateur Radio. Pedro introduced a paper recommending that the realignment of the 40 meter band be placed on the agenda of a future WRC. That paper was accepted and the future conferences section of the CITEL preparatory document for WRC-97 included a brief paragraph to that effect. Paul's was a US input document urging administrations to become signatories to the International Amateur Radio Permit (IARP) Convention, which has been signed by Argentina, Canada, Peru, Trinidad and Tobago, the United States, Uruguay and Venezuela. That was the first item on the meeting agenda and was approved as a new CITEL PCC.III Resolution.

PCC.III meets about three times a year. It will meet in Brazil in June and Mexico in September, not only to help the countries in the Region to get ready for WRC-97, but also to carry on the regular standardization and development work of CITEL. IARU Region 2 and ARRL regularly attend these meetings.

You can learn more about CITEL from its World Wide Web site at **http://www.oas.org/EN/PROG/CITEL/citel.htm** (English language) and **http://www.oas.org/SP/PROG/CITEL/citel.htm** (Spanish).—*Paul Rinaldo, W4RI*

Progress in Europe Toward an International Amateur LF Allocation

Early long-distance radiocommunication was accomplished using very long wavelengths, much lower in frequency than the present-day AM broadcast band. These frequencies are still prized for certain applications because of their reliability over relatively long distances and their ability to propagate underwater, underground, and over mountains. There is, of course, limited bandwidth available; the entire low-frequency (LF) range of 30 to 300 kHz is narrower than a typical HF amateur band. Radio amateurs have not enjoyed an international LF allocation since being relegated to the wavelengths of "200 meters and down."

The first steps toward such an international allocation have been taken in Europe, where the Frequency Management Working Group (FMWG) of the CEPT European Radiocommunications Committee (ERC) agreed in February 1997 (with Greece and the Czech Republic reserving their positions) that the band 135.7 to 137.8 kHz could be allocated to the amateur service on a secondary basis. After consultation with the Radio Regulatory Working Group, the Draft Recommendation will be submitted to the ERC for approval.

Finland wasted no time in making the band available to its amateurs, and authorized operation on April 1, 1997! The United Kingdom earlier made a narrow band at 73 kHz available for amateur operation, but has indicated that it will withdraw this allocation in favor of a harmonized European allocation, once such an allocation has been agreed upon.

Progress toward this new allocation is an accomplishment of IARU Region 1 and especially of the chairman of its External Relations Committee, Wojciech Nietyksza, SP5FM, who is a regular attendee and frequent contributor at CEPT ERC meetings.

Additional information on this and other European allocations initiatives may be obtained at the excellent Web site of the European Radiocommunications Office (ERO), **http://www.ero.dk**.

David Court, G3SDL/OZ3SDL, has been the Head of the ERO in Copenhagen since its creation in 1991. Dave has accepted a new position as managing director of the GSM MoU Association in Dublin, and will be leaving the ERO at the end of June. We wish him well in his new position.—*David Sumner, K1ZZ*

Amateur Satellites

*Edited by **Steve Ford, WB8IMY** • Managing Editor*

A Box for Phase 3D

By Brian Coggins, KC4LLD
1308 LaSalida Way
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Earning the Eagle Scout rank in the Boy Scouts of America requires extensive work, including completing many requirements, and earning merit badges and badges of rank. One of the most difficult requirements is the completion of a service project that benefits a school, church, or the community in general. The project may *not* be an individual effort; it must instead involve leading a *group*. As I prepared to complete my Eagle Scout rank, I was faced with the typical challenge: Finding a project! Well, I found a project, but it wasn't exactly mainstream.

I was investigating all of the usual project sources, such as my church and school, when my father came across an intriguing idea. Why not design and build the AMSAT Phase 3D shipping container—the box in which the Phase 3D satellite will be shipped to its test and launch facilities?

More Than Just a Box

The Phase 3D container is no ordinary crate. Unlike previous AMSAT satellite receptacles, which were small enough to be easily carried, this container's outside dimensions were 108×93×66 inches. We're talking about a box that's almost too wide to fit in the largest truck available. It must also be strong enough to accommodate a satellite that weighs more than 1000 pounds. It would seem obvious that building a container of this size would take a great amount of time and effort, but I have a problem seeing the obvious until it's too late!

I proposed my project in August 1995, over a year before its final completion. After two months of shuffling papers, the project was finally approved by both the Boy Scouts and AMSAT. Interestingly enough, during the approval process, the Boy Scouts scrutinized my proposal the most. AMSAT welcomed my help, although I was warned many times that I didn't know what I was getting into. Of course, I kept going.

After my plans were approved, I then set out to purchase materials for the project and find a place to build it. We decided to construct the box in the carport of an old house on a nearby lake. We planned to store the materials in a small shed on the property.

Construction and Delivery

Construction of the container began in July 1996. I planned to finish by the end of August. Once we started the construction, I realized just how much work this project would take! It seemed as if we would never finish, but after four long months, the container was complete. A total of 21 Scouts helped with the construction, working weekends and evenings.

The container was fabricated from fir plywood and spruce beams of various sizes. Two of its sides and its lid were removable; the other two sides were fastened to its base. We used standard wood screws and glue for most of the assembly. The removable components were attached with bolts and brackets.

Delivering the finished product was our final challenge. The container was lifted onto a flatbed truck by 12 men, then driven 45 miles to the Orlando International Airport (where the satellite was being assembled). Once at the Phase 3D Laboratory, the container was eased off the trailer with a special oversize forklift borrowed from a nearby cargo company. Finally, on November 30, 1996, over a year after the project was originally proposed, it was complete!

Table 1—RS-16 Frequencies (MHz)

Uplink	*Downlink*	*Beacons*
145.915–145.948	29.415–29.448	29.408 29.451 435.504 435.548

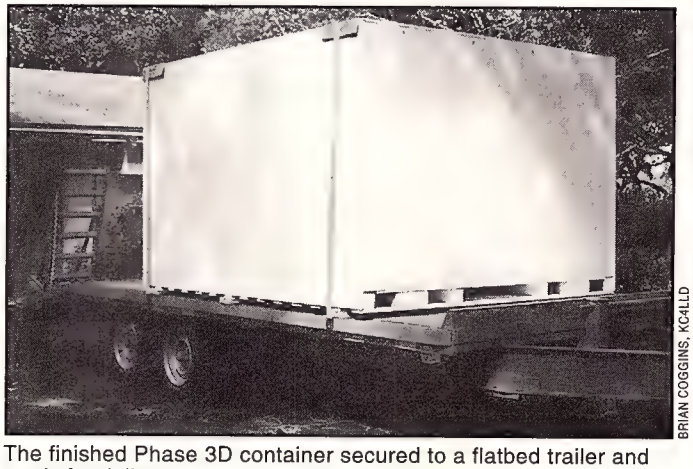
RS-16 In Orbit!

In the early morning hours of March 4, 1997, a new Russian ham satellite was inserted into orbit. RS-16 is part of the Zeya satellite launched from the new Svobodny cosmodrome aboard a Start-1 rocket. The Start-1 is a converted intercontinental ballistic missile.

Like its brothers RS-10 and RS-15, the RS-16 satellite is a Mode A bird that listens for CW and SSB signals on 2 meters and repeats on 10 meters (see Table 1). RS-16 is different in several respects, though. It has beacons on 70 cm, which is new for a Russian Amateur Radio satellite. RS-16 also orbits at an average altitude of only 445 km. This translates to a significantly smaller footprint on the ground—about 2200 miles in diameter, compared to 3500 miles in diameter for RS-10.

Congratulations to the Russian amateur satellite program on a job well done—and a new bird for beginners!—*WB8IMY*

Brian, KC4LLD, checks a load of raw lumber at the construction site.



The finished Phase 3D container secured to a flatbed trailer and ready for delivery.

BRIAN COGGINS, KC4LLD

Surfing the Ham Bands

Last month, I discussed the battle between Web browsers, specifically Microsoft *Internet Explorer* versus Netscape *Navigator*. This time, we'll examine using your Web browser as a ham radio application—not as a front end for the Internet (to surf ham-related Web pages), but as a front end for your radio to surf the ham bands.

In the February 1997 issue of the always informative Texas Packet Radio Society's *TPRS Quarterly Report*, Charles Brabham, N5PVL, proposes this very idea. He suggests that hams transmit HTML documents via packet radio (HTML, or HyperText Markup Language, is the programming protocol used to create Web pages):

"HTML documents are plain ASCII text, which AX.25 packet handles just fine. On a very basic level, text-based HTML would give us a point 'n' click interface for packet, presenting no significant additional loading to the network. It's unlikely though, that hams accustomed to using Internet HTML with its rich graphics will be content with just text! Hams will want to have graphics in the packet 'hampages,' which HTML packet will introduce."

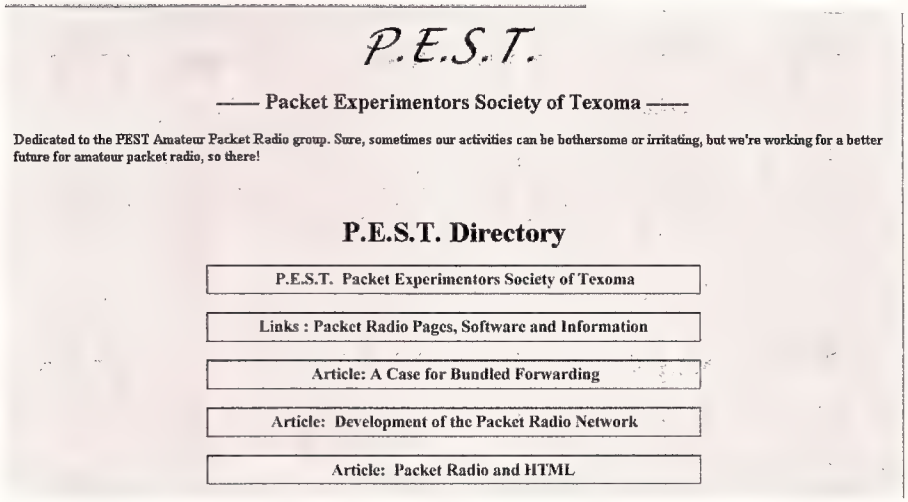


Figure 1—N5PVL lets you sample HTML packet radio at http://www.texoma.com/~n5pvl.

Wantin Ain't Gettin

Ham surfers will want graphics just like Internet surfers, but, as N5PVL points out, those graphics are in binary format, and they are *big*. "These two factors place severe limitations on us when we attempt to transmit this kind of information over a packet radio network. *Binary* and *big* translate effectively to *unreliable* and *slow*."

N5PVL offers a solution to this problem, "HTML doesn't *have* to use graphics which are transmitted along with the document itself or which happen to reside in the standard HTML cache of recently received graphics. You can also point to and utilize graphic files which reside elsewhere in the receiving station's system."

"I propose that rather than attempting to modify standard HTTP/HTML protocol or software, we define a new way to use the tools which HTML already provides in a way which will allow us to use graphics constantly while hardly ever having to transmit or receive them."

N5PVL suggests that each HTML packet radio station have a standard set of 50 or so graphic files that incoming HTML files can use as needed. For example, if an incoming HTML file called for the ARRL logo, your Web browser would load that graphic from the directory on your hard disk where the HTML ham radio graphic files live. This concept can include standard sound and animation files, too.

To make things more interesting, you could personalize the HTML ham radio graphic files stored on your hard disk. Instead of the standard black and white ARRL diamond logo, you could use a logo of a different color and/or different shape.

WWW Page of the Month: Ham Surfing Demo

To demonstrate these concepts, you can check out this month's Worldwide Web Wireless page of the month, which by some strange coincidence is N5PVL's Web page at **http://www.texoma.com/~n5pvl**. Once you access this page, select the article titled "Packet Radio and HTML" and follow the directions at the end of the article to see how N5PVL's ideas work.

Beyond HTML Packet Radio

One big advantage of using HTML is that it is platform-insensitive. You can run *Windows*, Macintosh, *UNIX*, or whatever, and HTML works—as long as you use a HTML-compatible browser on your platform of choice. Add *Java* to the recipe and we will really be cooking. (*Java* is a computer language for Web browsers that permits programmers to create miniapplications—known as *applets*—that run within Web-browser windows.) *Java* applets bring life to relatively static Web pages and make interactive and specialized applications a reality.

For a taste of what *Java* can do, check out some of the Web pages that use *Java* to display local, regional and national APRS activity, for example, **http://www.wa4dsy.radio.org/aprs/soeast.html**, **http://web.usna.navy.mil/~bruninga/radio.html** or **http://www.asb.com/usr/w2g3zfj/g3zfj1.htm**. (Note that for you to sample *Java*, your Web browser must be *Java*-enabled. The current versions of both *Internet Explorer* and *Navigator* are *Java*-enabled.) Besides displaying APRS activity, *Java* applets allow you to interact with the system to remotely control and obtain information from the display.

The Big Disk

Last year, there was *The Beatles' Anthology*. This year, it is TAPR's Anthology. The folks who brought you packet radio, as you know it, have just released a new CD-ROM full of nearly everything you need to know about the digital side of ham radio.

Its real name is *TAPR's 1997 CD-ROM*. The CD contains 650 MB of information, including the *TAPR* software library, TAPR general information, TAPR special-interest group (SIGs) information, SIG e-mail archives, DSP information, audio and movie files, the North American Digital Systems Directory and a variety of utilities.

For more information, see the New Product announcement on p 59.

*One Glen Ave
Wolcott, CT 06716-1442
e-mail **stanzepa@ct2.nai.net**
URL **www.tapr.org/~wa1lou**

Coming Conventions

*Edited by **Gail Iannone** • Convention Program Manager*

TEXAS STATE CONVENTION

June 6-8, 1997, Arlington

The Texas State Convention, sponsored by HamCom and several Dallas/Fort Worth-area clubs, will be held at the Arlington Convention Ctr, next to Six Flags Over Texas. Features include inside flea market and outside flea market (outside sponsored by Dallas ARC; contact Glen Kitto, KC5WBQ, 214-691-2888, e-mail **gkitto@teleteam.com**; or **http://www.w5fc.org**), vendors, programs, forums, VE sess (all classes, Sat 9 AM and 2 PM, Sun 9 AM), refreshments. Talk-in on 147.14. Admission is $9. Tables are $25 (inside, electrical outlet, $36). Contact Tom Gentry, K5VOU, Box 861829, Plano, TX 75086, 972-442-1721, fax 972-442-3609; or **http://www.hamcom.org**.

GEORGIA SECTION CONVENTION

June 13-14, 1997, Albany

The Georgia Section Convention (15th Annual Albany Hamfest and Computer Fair), sponsored by the Albany ARC, will be held at the James H. Gray Sr Civic Ctr. Doors are open Fri 5-9 PM, Sat 9 AM to 4 PM. Features include VE sess (Fri 6 PM), outdoor flea market (Sat only, $10), forums, free parking. Talk-in on 146.82. Admission is $5. Contact Arthur Shipley, N4GPJ, c/o AARC, Box 70601, Albany, GA 31708-0601, 912-439-7055; or e-mail **n4gpj@isoa.net**.

NORTHWESTERN DIVISION CONVENTION

June 13-15, 1997, Seaside, OR

The Northwestern Division Convention, sponsored by the Oregon Tualatin Valley ARC, will be held at the Convention Ctr. Features include seminars, meetings, ARRL forum, VE sess. Talk-in on 146.66. Admission is $6 in adv, $8 at the door. Contact Randy Stimson, KZ7T, 9890 SW Inglewood St, Portland, OR 97225, 503-297-1175; or e-mail **kz7t@arrl.org**.

1997
May 30–June 1
Atlantic Division, Rochester, NY*
July 12-13
Central Division, Indianapolis, IN
July 18-20
Montana State, East Glacier
July 25-27
Arizona State, Flagstaff
August 1-3
South Texas Section, Austin
August 2
Missouri State, Springfield
August 2-3
ARRL National Convention, Jacksonville, FL
August 10
Michigan State, Jackson

*** See May *QST* for details.**

GEORGIA STATE CONVENTION

June 21-22, 1997, Atlanta

The Georgia State Convention ('97 Atlanta Ham-Festival and Computer Expo), sponsored by the Atlanta RC, will be held at the City Hall East Exhibition Ctr, 640 North Ave. Doors are open for setup Fri noon to 5 PM, Sat 5-8:30 AM; public, Sat 9 AM to 4 PM, Sun 9 AM to 3 PM. Features include indoor air-conditioned flea market, vendors, commercial exhibitors (Dick Bentley, K2UFT, e-mail **dickb@ akorn.net**; or John Fearon, W4WKP, 770-466-0099), covered tailgating ($6 per day plus adm), forums, VE sess (Sat, reg 8 AM, exams 9 AM), free parking, refreshments. Talk-in on 146.82, 145.35. Admission is $6 in adv, $8 at the door. Tables are $20 ea (plus adm, good for weekend). Contact William Bass, W4LFC, 770-493-8438, fax 770-493-6982, e-mail **BillW4LFC@juno.com**; **http://www.saf.com/arc**.

The ARRL National Convention: Jacksonville, FL, August 2-3, 1997

Join hams and League officials from across the country at the '97 ARRL National Convention to be held at the Prime F. Osborn Convention Center, Jacksonville, FL, August 2-3. The event is sponsored by the Greater Jacksonville Hamfest Association. "Public Service" is this year's theme. Don't miss it! For convention information, call 904-272-0726; or see **http://users.southeast.net/~jrmoore/hamfest.htm**. See you there!

Attention Hamfest and Convention Sponsors:

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You're encouraged to register your event with HQ as far in advance as your planning permits. Hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register. Registering dates with ARRL HQ doesn't constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your division director. For conventions, approval must be made by your director and by the executive committee. Application forms can be obtained by writing to or calling the ARRL convention program manager, tel 860-594-0262.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance. QST

Hamfest Calendar

*Edited by **Gail Iannone** • Convention Program Manager*

Attention: The deadline for receipt of items for this column is the **1st of the second month preceding publication date.** For example, your information must arrive at HQ by **June 1** to be listed in the **August** issue. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes or any kind of games of chance such as raffles or bingo.

(Abbreviations: *Spr* = Sponsor, *TI* = Talk-in frequency, *Adm* = Admission.)

Alberta (Red Deer)—Jun 13-15. Bob King, VE6BLD, 403-782-3438.

California (Livermore)—Jun 1. Noel Anklam, KC6QZK, 510-447-3857.

†ARRL Hamfest

†California (Santa Maria/Orcutt)—Jun 15; set up 7:30-9 AM; public 9 AM to 4 PM. *Spr:* Satellite ARC. Newlove Picnic Grounds, S of Orcutt, W of Hwy 101, 1.7 mi S of Clark Ave, 4.5 mi N of Palmer Rd. Swapfest, tailgating ($10), demonstrations, "Santa Maria–style barbecue" (11 AM, adults $7, under 12 $4), T-hunts, QLF, handicapped accessible, free parking. *TI:* 145.14. *Adm:* $1, under 12 free. Tables: $10. SASE to Santa Maria Swapfest, Box 2067, Orcutt, CA 93457; or call Eric Lemmon, WB6FLY, 805-733-4416; fax 805-733-4418; e-mail **elemmon@impulse.net**.

Colorado (Loveland)—May 31. Michael Robinson, N7MR, 970-282-1167.

†Connecticut (Goshen)—Jun 21; set up 6 AM; public 8:30 AM to 2 PM. *Spr:* Southern Berkshire ARC. Goshen Fairgrounds, 1/2 mi S of traffic circle at junction of Rtes 4 and 63. Tailgating (unlimited, $5, includes 1 adm), refreshments. *TI:* 147.285. *Adm:* $3, under 12 free (includes parking). Tables: $5 (power $2 extra). Bob Schoenfeld, KA1ARR, Spring Hollow Rd, Sheffield, MA 01257, 413-229-8695; or e-mail **collins@li.com**.

Florida (Ft McCoy)—Jun 14. Bob Dary, K4VDX, 352-694-6160.

Georgia (Albany)—Jun 13-14, Georgia Section Convention. See "Coming Conventions."

Georgia (Atlanta)—Jun 21-22, Georgia State Convention. See "Coming Conventions."

Idaho (Rathdrum)—Jun 14. Barry Burnett, KC7MPM, 208-773-2903.

Illinois (Granite City)—Jun 8. Bill Dusenbery, N9OQK, 618-398-1456.

Illinois (Springfield)—May 31. Don Pitchford, W9EBK, 217-789-4519.

†Indiana (Crown Point)—Jun 15; set up 6 AM; public 8 AM to noon. *Spr:* Lake County ARC. Lake County Fairgrounds, SW side of Crown Point. Vendors, computers, software and hardware, VE

sess, refreshments. *TI:* 147.0, 146.52, 442.075. *Adm:* $5. Tables: $6. Malcolm Lunsford, WN9L, 6721 Harrison Ct, Merrillville, IN 46410-3323, 219-769-3925; or e-mail **72202.230@compuserve.com**; **http://www.jorsm.com/~dharney/lcarc.htm**.

†**Kentucky (Paducah)—Jun 14,** 9 AM to 3 PM. *Spr:* Paducah ARA. Executive Inn Convention Ctr, downtown Paducah, 1 Executive Blvd, off Park Ave. Vendors, equipment, WX forum, VE sess (1 PM), free parking. *TI:* 147.06. *Adm:* $5. Tables: $6. Craig Martindale, WA4WBU, 2509 Trimble St, Paducah, KY 42001, 5202-444-6822; or e-mail **KC4ENA@APEX.Net**.

†**Louisiana (Slidell)—Jun 21.** *Sprs:* Ozone and Pearl River County ARCs. Slidell City Auditorium. ARRL and Direction Finding forums, VE sess. *TI:* 147.27 (114.8 Hz). *Adm:* $3. Ronald Riviere, WB5CXJ, Box 1009, Lacombe, LA 70445; 504-882-5067.

†**Maine (Hermon)—Jun 14,** 8 AM to 1 PM. *Spr:* Pine State ARC. Hermon HS, I-95 to Exit 44 (Cold Brook Rd) to US Rte 2, W 1 mi to HS. Dealers, tailgating, demonstrations, ARRL forum, Section Meeting, VE sess (all classes), refreshments. *TI:* 146.94, 146.52. *Adm:* $3, under 12 free. Tables: $8. Roger Dole, KA1TKS, RR 2, Box 730, Bangor, ME 04401; 207-848-3846.

†**Maryland (Frederick)—Jun 15.** *Spr:* Frederick ARC. Frederick County Fairgrounds, E Patrick St, adjacent to downtown Frederick. *TI:* 146.64, 147.06, 146.52, 448.425. *Adm:* $5. Eric Gammeter, N8AAY, 10494 Balmoral Pl, New Market, MD 21774-6947; 301-865-0865.

Massachusetts (Cambridge)—Jun 15. Nick Altenbernd, KA1MQX, 617-253-3776.

†**Michigan (Chelsea)—Jun 1;** set up 6 AM; public 8 AM. *Spr:* Chelsea ARC. Chelsea Fairgrounds, I-96 to M52, left at first stop sign. Swap 'n Shop, trunk sales (rear entrance only), equipment, computers, vintage radios, plenty of parking, handicapped parking, refreshments. *TI:* 146.98. *Adm:* adv $4, door $5. Tables: $10 (per 8 ft). Alan Robbins, KB8VCK, 3800 Hooker Rd, Pinckney, MI 48169; 313-878-0363.

†**Michigan (Midland)—Jun 14;** set up 6:30 AM; public 8 AM to 1 PM. *Spr:* Midland ARC. Midland County Fairgrounds, Gerstacker Bldg, US 10 to Eastman Rd Exit, enter Fairgrounds from Airport Rd entrance. New and used electronic and computer equipment, trunk sales ($5 per spot plus adm), VE sess (off site), camping (Fri eve, $8), free parking, refreshments. *TI:* 147.0. *Adm:* $4. Tables: per 8-ft section adv $6, door $10 (plus adm; power available inside within 50 ft, bring your own cords). Jeff Weinberg, W8CQ, 870 S Grey Rd, Midland, MI 48640, 517-839-9371 or 517-636-0643; or e-mail **w8cq@bytethis.com**.

†**Michigan (Monroe)—Jun 15,** 7:30 AM to 1 PM. *Spr:* Monroe County Radio Communications Assn. Monroe County Fairgrounds, M-50 at Raisinville Rd, 2 mi W of Monroe. Vendors, trunk sales ($5, 8-ft space), DX forum, overnight camping ($15), free parking, handicapped parking, refreshments. *TI:* 146.72. *Adm:* adv $4, door $5. Tables: $10 (8 ft). Fred VanDaele, KA8EBI, 4 Carl Dr, Monroe, MI 48162; 313-242-9487 eves.

New Hampshire (Lempster)—Jun 7. Conrad Ekstrom, WB1GXM, 603-543-1389.

†**New Jersey (Dunellen)—Jun 21;** set up 6 AM; public 7 AM to 2 PM. *Spr:* Raritan Valley RC. Columbia Park, near intersection of Rtes 529 and 28. ARRL, AMSAT, QSL Bureau Reps, DXCC/WAS verification, refreshments. *TI:* 146.625, 442.25 (141.3 Hz), 146.52. *Adm:* buyers $5, sellers $10 ($5 ea additional space). Bob Pearson, WB2CVL, 908-846-2056 before 8 PM; or e-mail **WB2CVL@ WORLDNET.ATT.NET**.

†**New Jersey (Teaneck)—Jun 7,** 8 AM to 2 PM. *Spr:* Bergen ARA. Fairleigh Dickinson University, Rte 4 E/W to River Rd Exit, follow signs. Flea market ($10, includes adm; a limited number of outdoor spaces are available with ac power at $20 ea, call to reserve), vendors ($10 per space), VE sess (Novice through Amateur Extra, 8-10 AM, bring original FCC license, photocopy, positive ID), plenty of parking, refreshments. *TI:* 146.79, 146.52. *Adm:* $3, nonham spouses and children free. Jim Joyce, K2ZO, 286 Ridgewood Blvd N, Westwood, NJ 07675, 201-664-6725; or e-mail **jjjoyce@bc.cybernex.net**.

†**New York (Cortland)—Jun 14.** *Spr:* Skyline ARC. Cortland County Fairgrounds, I-81 to Exit 12, left onto Rte 281, left onto Fisher Ave, right onto Fairgrounds Dr, follow signs. Flea market ($2 per space), dealers. *TI:* 147.18. *Adm:* adv $4, door $5. Tables: $10. Andrew Slaugh, KB2LUV, 1134 Old Stage Rd, Cortland, NY 13045-9007, 607-753-0597; or e-mail **sany@servtech.com**.

†**North Carolina (Salisbury)—Jul 5;** set up 6 AM; public 8 AM to 2 PM. *Spr:* North Carolina Alligators Group. Civic Ctr, from I-85 take Hwy 52 W/E Innes St, turn left on South Boundary St, fest is on left. Flea market, dealers, auction (1 PM), refreshments. *TI:* 146.625. *Adm:* adv $3, door $4, nonham spouses free. Tables: $5. Walter Bastow, N4KVF, 3045 High Rock Rd, Gold Hill, NC 28071; 704-279-3391.

†**North Carolina (Winston-Salem)—Jun 14,** 8 AM to 3 PM. *Spr:* Forsyth ARC. Dixie-Classic Fairgrounds, I-40 to US 52 N to Akron Dr Exit, take left at light, follow signs. Flea market, tailgating, ARES and NTS forums, VE sess, refreshments. *TI:* 146.64. *Adm:* adv $6, door $7. Tierney "Sparky" Ramey, KE4TES, Box 30114, Winston-Salem, NC 27130; 910-723-7388 or 910-777-0381.

†**Ohio (Macedonia)—Jun 15,** 8 AM to 1 PM. *Spr:* Cuyahoga ARS. Nordonia Hills HS, 8006 S Bedford Rd; Ohio Tpke to Exit 12, N on State Rte 8 to Highland Rd, go E on Highland Rd, turn N on S Bedford Rd. Hamfest/Computer Show, flea market. *TI:* 146.82, 443.825. *Adm:* adv $3, door $4. Rich James, N8FIL, 7620 Crestwood Ln, Northfield Ctr, OH 44067, 216-468-2035 or 800-404-2282; or e-mail **hamfest@cars.org**; **http://www.cars.org**.

†**Ohio (Milford)—Jun 21.** *Spr:* Milford ARC. Live Oaks Vocational School, I-275 to Rte 28, right onto Buckwheat Rd. Commercial vendors, tailgating, VE sess, refreshments. *TI:* 147.345. *Adm:* $5. Chris Reinfelder, KB8SNH, 3691 Charter Oak, Amelia, OH 45102; 513-753-5066.

Ontario (Marmora)—Jun 21. Pete Blakely, VA3PGB, 613-473-1171.

Oregon (Seaside)—Jun 13-15, Northwestern Division Convention. See "Coming Conventions."

Oregon (Vernonia)—Jun 27-29. Betty Mickley, N7REX, 503-642-1284.

†**Pennsylvania (Dillsburg)—Jul 4;** set up Thurs 6-9 PM, Fri 6 AM; public 8 AM to 2 PM. *Spr:* Harrisburg RAC. Monagahan Firehall, 245 W Siddonsburg Rd. Dealers, tailgating (1 free space per vehicle, additional spaces $5 ea), VE sess (9 AM, walk-ins accepted), '97 PA QSO Party Banquet Buffet (Sat, Jul 5, Best Western Harrisburg W Conference Ctr, $18.50 per person), refreshments. *TI:* 146.76. *Adm:* $4, nonham spouses and children free. Tables: before Jun 1 $12, on or after Jun 1 $15. Tom Hale, WU3X, Box 418, Halifax, PA 17032, 717-232-6087; or e-mail **fabinfo@fabral.com**.

†**Pennsylvania (Hanover)—Jun 21,** 8 AM. *Spr:* Hanover Area Hamming Assn. Pleasant Hill Fire Co carnival grounds, halfway between Hanover, PA, and Manchester, MD; on PA Rte 94/MD Rte 30. Amateur Radio and Computer Show, vendors, dealers, tailgating (gates open at 6 AM for tailgaters, 10-ft spaces, adv $3, door $5, plus adm), electronic devices, computer hardware and software, VE sess (Bill, WA3ZER, e-mail **wa3zer@aol.com**), refreshments. *TI:* 146.895. *Adm:* adv $3, door $5, under 12 free with adult. Tables: $15 (10 ft, includes 1 adm, gates open at 5 AM for indoor vendors). Wayne Leister, N3MTR, c/o HAHA, Box 381, Manchester, MD 21102, 410-239-8451; or e-mail **n3mtr@qis.net**; **http://www.serve.com/haha/**.

†**Pennsylvania (Wilkes-Barre)—Jul 6;** set up Sat 2-9 PM, Sun 6 AM; public 8 AM to 4 PM. *Spr:* Murgas ARC. Luzerne County Fairgrounds, Rte 81, Exit 47 to Rte 309 N to Rte 118 W. Hamfest/Computerfest; exhibitors; new and used computer, radio, and electronic equipment; tailgating; VE sess (10 AM, walk-ins accepted); refreshments. *TI:* 146.61, 146.52. *Adm:* adv $4, door $5, nonham spouses and under 16 free. Tables: inside $14 (bring your own extension cords), outside $5. Bob Michael, WB3FAA, 15 Valley View Dr, Pringle, PA 18704, 717-288-3532; or Mike Benish, K3SAE, 717-388-6863.

Quebec (Sorel-Tracy)—May 25. Jean Gadoury, VE2UL, 514-587-2986.

Texas (Arlington)—Jun 6-8, Texas State Convention. See "Coming Conventions."

†**West Virginia (Bluefield)—Jun 15,** 9 AM to 3 PM. *Spr:* East River ARC. Brushfork Armory, Rte 123 (Falls Mills Rd), 1/2 mi W of US 52 N. Flea market and dealers (contact Bob Frazier, WB8NRK, 304-425-8464; or e-mail **cna00188@mail.wvnet.edu**), VE sess (9 AM, walk-ins, Bluefield State College, 1 mi S of hamfest), paved parking, handicapped accessible, refreshments. *TI:* 145.49. *Adm:* $5, Seniors $4, under 12 free. Tables: $5. SASE to Bluefield Hamfest Inc, 412 Ridgeway Dr, Bluefield, VA 24605-1630; or call Don Williams, WA4K, 540-326-3338; e-mail **wa4k@amsat.org**.

Wisconsin (Junction City)—Jun 8. John Feltz, WA9LWJ, 715-457-2506.

Attention All Hamfest Committees!

Get official ARRL sanction for your event and receive special benefits such as free prizes, handouts, and other support. If you are an affiliated club, you are also entitled to receive a 10% commission on sales of League publications!

It's easy to become sanctioned. Contact the Convention and Hamfest Branch at ARRL Headquarters, 225 Main St, Newington, CT 06111. Or send e-mail to **giannone@arrl.org**. QST

Strays

QST Congratulates...

◊ Pat Murray, NW2I, on being named the 1996 "Member of the Year" by the Lancaster ARC. Pat, of East Aurora, New York, is the club's "sunshine person," and has participated as a volunteer examiner in over 100 test sessions. Pat is an Amateur Extra, holds a handful of commercial radio licenses, and is a DXCC member.

◊ Bo Pike, WØHV, on receiving the Lifetime Recognition Award from the Central Country Music Awards Committee, recognizing Bo's 63 years of guitar-picking, banjo-plucking, and yo-yo work in shows and with C&W bands in the Central US.

ASTRONOMY NET

◊ Richard, WØRPV, is starting a net for hams interested in astronomy. Richard Z. Plasencia, WØRPV, 3632 Lynbrook Dr NE, Cedar Rapids, IA 52402-2864; e-mail **plasencia@worldnet.att.net**.

RADIO CONTROL FLYERS' NET

◊ The RC Flyers' Net meets from 6 to 7 PM ET daily on 3933 kHz SSB. Net Control is usually Fred, W4RCF, in Goldsboro, NC. Anyone interested in RC flying is welcome. George, W1OLP, tells us that they have one famous net member, Walt, W3NPS. One of Walt's early RC models hangs in the National Air and Space Museum of the Smithsonian Institution, in Washington, DC.

Exam Info

Edited by **Bart J. Jahnke, W9JJ** • ARRL/VEC Manager

New Novice and Technician Question Pools for 1997

• Effective July 1, 1997, newly revised Novice (Element 2) and Technician (Element 3A) question pools will be implemented for all Novice and Technician written examinations.

• Beginning July 1, 1997, to implement the addition of five RF Safety questions required by FCC Rule changes: the Novice exam will expand by five questions from 30 to a total of 35 (26 correct answers is a passing score); The Technician exam will also expand by five questions from 25 to a total of 30 (22 correct answers is a passing score).

According to the established question-pool revision cycle, it's time to implement new Novice (Element 2) and Technician (Element 3A) question pools. So, beginning July 1, 1997, VE teams across the country will be administering their Novice and Technician written examinations using questions drawn from the new question pools. You'll know that you are taking the new (correct) test when you open the examination booklet(s) and count the number of questions (see the announcement above). If you attend an examination after July 1, 1997, and your exam does *not* contain the new questions totals, seek out the administering VEs and bring the discrepancy to their attention.

Why Five More Exam Questions?

As I discussed in my January 1997 column, on August 7, 1996, the FCC announced new RF safety requirements for amateur stations. One of the mandates of this FCC action was the addition of five Novice, Technician and General exam questions to cover the specific topic of RF safety.

Given the time constraints involved, the ARRL filed an Emergency Motion for an Extension of the Implementation Date for the exam questions. FCC granted our petition, allowing the five additional Novice and Technician RF safety questions to be added in examinations beginning July 1, 1997. The five additional General class RF safety questions will be added to examinations beginning July 1, 1998. This means that on July 1, 1998, the General written examination (Element 3B) will expand from the present total of 25 questions to 30.

Starting with Novice and Technician exams this July, all RF safety questions have been grouped into the FCC's new subelement (titled "RF Safety"). The National Conference of VECs Question Pool Committee (QPC) worked diligently under severe deadline pressure to compose more than 170 Novice and Technician RF Safety questions, based on FCC Rules and RF Safety Guidelines (including FCC OET Bulletin 65). In the revised pools, these subelements are labeled "N0" and "T0."

A New General Syllabus Is Available

A new General class (Element 3B) question pool syllabus was released by the QPC on February 1, 1997. This new syllabus will be used as a guide during revisions of the General question pool later this year.

Now's the time to start thinking about updates for our Advanced question pool syllabus. In fact, the QPC welcomes your input! You can submit suggestions to the QPC by writing to QPC Chairman Raymond Adams, W4CPA, 5833 Clinton Hwy, Ste 203, Knoxville, TN 37912-2500. And please send copies to Fred Maia, W5YI, QPC Vice-Chairman, Box 565101, Dallas, TX 75356-5101; to Scotty Neustadter, W4WW, 9710 Dortmund Dr, Huntsville, AL 35803-1116; and to me at ARRL Headquarters.

For copies of the new Novice and Technician pools, or the new General syllabus, contact: ARRL/VEC, 225 Main St, Newington CT 06111; e-mail **vec@arrl.org**. The new pools will also appear on the ARRLWeb at **http://www.arrl.org/arrlvec/pools.html**.

FCC MAKES SEVERAL MINOR RULES CHANGES

The FCC announced on April 1, 1997 (to take effect May 12, 1997), several minor rules changes. This month's "Washington Mailbox" column covers these issues in some detail. However, I'd like to focus on the "VE Session Manager" decision.

FCC was petitioned (*not* by the ARRL!) to establish a means by which one VE is ultimately responsible for everything that goes on at a test session. The ARRL uses the informal position in our system of a "VE Team Liaison" to our VEC. Other VECs may use a "VE Team Leader" concept or something similar. Even so, it was always clear to the VEs and VE teams that each of the administering VEs was *jointly responsible* for their individual actions. None of them could duck responsibility if something went wrong. ARRL opposed the single-person session manager proposal on this and related grounds.

In considering the comments FCC received on this issue, they decided that VE teams could choose to appoint a session manager or leader. The FCC said that their amended rules will now emphasize: (1) that the three VEs who sign the certification statement are jointly and individually accountable for the proper administration of each examination element reported on the examinee's license application document; (2) these VEs may, but are not required to, delegate to other qualified VEs the actual administration of test elements; (3) VEs may, but are not required to, form themselves into teams; (4) a VE team may, but is not required to, select a VE session manager to organize activities at an examination session and conduct liaison functions with the coordinating VEC; (5) the VEC is responsible for resolving discrepancies appearing on the license application document and verifying that the VEs' certification statements are properly completed.

The FCC feels that these amendments will improve the licensing process by providing the VEs with the flexibility to implement efficient testing procedures, while retaining a key safeguard against improperly administered examinations.

What's the ARRL/VEC Position on these Changes?

The new rules do not change what the ARRL/VEC or our VEs will do when they assemble themselves in groups of three or more. In essence, our VE team liaison position has been a session manager of sorts, and we expect that person will continue to do what the VE team asks of him/her.

The one difference, of possible benefit to ARRL VE teams with more than three VEs on hand at test sessions, is that any VE present may sign the Form 610 and/or CSCE certifying to the results of a particular examinee's test. No longer will it be necessary that only the three VEs administering (for example) a particular written element be the VEs who can sign that applicant's Form 610 or CSCE. This should assist VEs in more efficient grading and overall exam proctoring, when a VE team has more than the minimum of three VEs available to help. Any qualified (by license class and ability) VEs can now sign any examination document.

Prepared by **John C. Hennessee, N1KB** • Regulatory Information Specialist

Part 97: Keeping Pace in Our Changing World

Part 97 is amended by the FCC fairly frequently, which shows that the FCC is responsive to the changing needs of the amateur community. The most recent Part 97 rule changeswere made by an FCC Report and Order released on April 1, 1997. It was no April Fool's joke! These rules are effective May 12.

The FCC combined several petitions into one proceeding (WT Docket 95-57). Four major changes were made: (1) The FCC tightened eligibility standards for clubs, (2) recognized the role of volunteer examiner teams and of session managers, (3) established a special event call sign system, and (4) authorized more flexible placement of self-assigned identifiers. The FCC declined to allow examination credit for licenses formerly held.

Q: How did the FCC tighten eligibility standards for clubs?

A: In response to an ARRL petition, the FCC agreed to increase the eligibility requirements for a club station license from *two* members to *four* members. The FCC said that "it is important to determine that the applicant for a club station license is a legitimate radio club and not just a person seeking to acquire additional call signs." Also, it "may help deter the filing of license applications by bogus clubs." Clubs seeking a club station license must have a name, a document of organization, management and a primary purpose devoted to the amateur service. Section 97.5(b)(2) was amended accordingly.

Q: What changes were made that affect volunteer examiners?

A: The FCC amended Sections 97.509(a) and (i), added Section 97.513 (a), (b), and (c), and amended Section 97.519 to reflect the following points: (1) The three VEs who sign the Form 610 are jointly and individually accountable for the proper administration of each examination element reported; (2) VEs may, *but are not required to*, delegate to other qualified VEs the actual administration of test elements (that is, different VEs can give different elements to the same examinee); (3) VEs may, *but are not required to,* form themselves into teams; (4) A VE team may, *but is not required to,* select a VE session manager to act as the liaison with the coordinating VEC; and (5) the VEC is responsible for resolving all discrepancies on Forms 610. More information will be forthcoming to ARRL VEs from the ARRL/VEC.

Q: How do the changes affect special event call signs?

A: Although the FCC did sign Special Temporary Authority requests last year authorizing the use of *one-by-one call signs* (eg, W1A) for special events, this practice was stopped pending the outcome of WT Docket 95-57.

Under the revised rules, the FCC set aside 750 one-by-one call signs for temporary use during events which are of special significance to amateurs and it announced that it had decided that a self-administered program would be more effective in assigning the calls. When a one-by-one call sign is issued, the recipient must announce his or her regularly assigned call sign *at least once per hour*, in addition to identifying every 10 minutes and at the end of the transmission using the temporary call sign. Outside volunteer entities called *special event call sign database coordinators* would coordinate this program, not the FCC. The FCC will certify the volunteer coordinator groups, who will be selected based on their ability to maintain and disseminate a common on-line database. The FCC will issue a future Public Notice with more information. *Remember that the program has not yet been implemented.*

Q: How does the FCC define the special event call sign system in the rules?

A: The new Section 97.1(a)(iii) states: "The call sign is selected by the station licensee from a list of call signs shown on a common data base coordinated, maintained and disseminated by the amateur station special event call sign data base coordinators. The call must have the single letter prefix K, N or W, followed by a single numeral 0 through 9, followed by a single letter A through W or Y or Z (for example K1A). The special event call is substituted for the call sign shown on the station license grant while the station is transmitting. The FCC will issue public announcements detailing the procedure of the special event call sign system."

Q: Can only Amateur Extra hams apply for special event call signs?

A: No. In fact, the FCC turned down a suggestion that would have limited special event call signs to Amateur Extra licensees only, since the operation of such a station requires no further skill and it conveys no greater privileges.

Q: Is an amateur who lives outside the continental US, in Hawaii, for example, limited to a one-by-one call sign even though it doesn't reflect his or her location?

A: Yes, the Hawaiian amateur is limited to the one-by-one format. The FCC stated that a much larger block of call signs would be necessary to accommodate the demand for additional special event call signs, and such a block is not available.

Q: What changes were made concerning the placement of self-assigned identifiers?

A: In the past, the FCC has specified that any self-assigned identifier must be placed *after* the primary call sign. Placing the identifier at the front of the call sign can give greater visibility to the station. Under the revised rules, a self-assigned identifier may be placed *before, after, or both before and after* the call sign. No self-assigned indicator may conflict with any other indicator specified by the FCC rules (such as interim upgrade designators) or with a prefix assigned to any other country.

Q: When I travel to a foreign country and obtain a reciprocal permit, can I put the foreign identification prefix wherever I want?

A: No. You must identify in the manner dictated by the foreign government.

Q: Has the FCC developed a list of possible identifiers?

A: No, since it is up to the amateur to make sure the identifier conforms with the rules. The Newington Amateur Radio League could identify as 5Ø/W1OKY, for example, to call attention to the 50th anniversary of the founding of the club.

Q: Where can I find a copy of an updated Part 97?

A: The 10th edition, third printing of *The FCC Rule Book*, published by the ARRL, should be available by the time you read this. *The FCC Rule Book* includes a complete and updated copy of Part 97 along with hundreds of pages worth of interpretation material. This book is frequently updated to stay current with the rules. ARRL publications are available from your local ARRL dealer or directly from the ARRL. Mail orders to the Publication Sales Dept, ARRL, 225 Main St, Newington, CT 06111-1494. Orders can be placed toll-free at 888-277-5289; faxed to 860-594-0303; or sent by e-mail to **pubsales@arrl.org**. Check out the full ARRL publications line on the World Wide Web at **http://www.arrl.org/catalog**. QST

YL News

Connie Dunn, KB5LES*

Adios, Amigos—33 and 73!

In Amateur Radio, there are several ways to end a contact.

If I'm using CW, I would send SK in Morse code.

Just about any time, "73" says it.

Another signal with similar meaning is "33," which is very special because only women use it among themselves.

Sometimes a conversation is closed by simply fading away. On some of my HF contacts, the band would suddenly change as I was talking to someone, taking my QSO with it.

Just as the HF radio bands change with the ebb and flow of ionization, so does life. And mine is ebbing in some directions, flowing in others—and, in some cases, slowing.

Perhaps it all started at the end of last year when I began experiencing eye problems. It seemed like one of those winter things—probably just a slight cold in one eye—so I didn't think much of it.

Of course, as a writer, I depend heavily on my eyesight. And I've taken it for granted, as most sighted people have a tendency to do. Although my permanent vision was never in jeopardy, I learned that surgery was in order. I needed a new tear duct. And, this time, duct tape wouldn't do the job!

The surgeon fashioned a new tear duct, the eye began to drain, and my red, slightly infected and leaky eye has returned to normal—except for a spaghetti strand of fiber that will remain in my eye and tear duct for the next six months to a year.

But this and other recent events have made me think—and reevaluate what I'm doing with my life. I think it's good for us to periodically look at what we're doing—assessing what we are and are not involved in, and deciding whether to continue or change our venues and our directions. Those actions keep us focused and moving in what we perceive to be the best direction.

That's what I've been doing during my recuperation from the eye surgery. And I have concluded that the best goal for me at the moment is to simplify all aspects of my life.

Five years have passed since I began writing "YL News," and I believe it is time to say 33 and 73—not because no one is reading the column, but because it is the right thing for me to do for myself.

I'm not leaving Amateur Radio. And I'll probably write occasional feature articles. I'm also retiring from writing columns in other magazines. I'm planning to invest more time in writing books, home-school teaching and being active in my several hobby areas, including ham radio.

I've had fun during the past years. I've met many OMs and YLs through writing the column. Looking back, I can't pick out any one experience that stands out. I've met astronauts and school teachers, physicists and medical doctors, engineers and mothers, and many more varieties of individual. I've met enthusiastic women who were just getting started in ham radio and others, just as enthusiastic, who darn near invented the hobby.

I've had the support of a lot of hams out there—YLs and OMs alike—who sent good stories and column ideas to me. That in itself is one of the nice things about ham radio: people working together for the common good, and to spread the word about nice things that our fellow hams have done and are doing, encouraging others to do likewise.

In a home-schooling family, life is always busy. My nine-year-old daughter Erin dances, takes acting lessons, plays soccer and continues to study for her Amateur Radio license. Together, Erin and I also tell stories. Between these endeavors, my writing articles, stories (mostly children's and folk tales) and books, life has become too filled to enjoy.

The common thread that holds us YLs together is friendship. And while ham radio operators, in general, share a level of camaraderie, YLs seem to take this more to a sisterhood plane.

Over the years, YLs have developed some strictly feminine terminology. And for those who want to pounce upon this separatist ideology, it is time to pause and reflect upon the history of YLs in a perpetually male-dominated hobby. As women tried to make Amateur Radio more appealing to themselves and to other women, new terms were coined.

Just as women today prefer to use the term "women" rather than "lady"—and rankle at the indignity of being referred to as "girls," licensed people of the female gender have always been referred to as "young ladies." Having grown up in an era when being a "lady" meant you had good manners and morals, I am not offended by the term. And since CW prevailed in the early days of radio, the term was shortened to the simple "YL."

Contrary to the common definition of the term "XYL" as "wife," the Young Ladies Radio League (YLRL), since its inception, has tried to reassert that this term denotes only an unlicensed female. "XYL" was originally used by the OMs (the "old men") to denote a wife. But, according to the YLRL, an "XYL" is an unlicensed woman. So you may hear the term used to mean either.

When I run across women who are unhappy at being referred to as YLs, thinking that it's derogatory and along the lines of "girl," I simply point out that we *could* be referred to as "OW"—"old woman." I don't know about you, but I find *old woman* far more distasteful than *young lady*.

An "Elmer" is a person who helps others learn about Amateur Radio. An "Elmira" is simply a feminine term for the same type of person, similar to the difference between an "actor" and an "actress."

An "eyelash QSO" is an in-person conversation between two women.

An "eyeball QSO" is an in-person conversation between men. For lack of any specific terminology, "eyeball QSO" is also used to describe a conversation between a woman and a man.

"73" means "best regards." And "33," exclusively a "YL thing," is used at the end of a YL-to-YL contact to mean "love and friendship."

So I bid you all—YLs and OMs alike—thanks and farewell; gracias y adios, amigos.

TU, 33 ES 73.... SK—*KB5LES*

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QST Is Looking for a New "YL News" Columnist

QST is looking for an experienced female writer to take the reins of "YL News." The ideal candidate should be an active ham of long standing whose operating activities are varied, who is active in the Young Ladies Radio League and the ARRL, and who has proven writing skills with previous publishing experience.

Interested parties are invited to submit a resume that lists their Amateur Radio experiences, their past and present ham and YLRL/ARRL activities, their qualifications and experience as a writer, and samples of previously published work. The publication samples should be those published in national or regional publications that have a wide readership, rather than local newsletters. Send your resume and writing sample to Steve Ford, WB8IMY, 225 Main St, Newington, CT 06111. QST

DXpeditions and American Principles: Must We Choose?

George H. Shands, W9WUU
1117 Wellesley Rd
Madison, WI 53705

Following a 30-year hiatus from ham radio, I have renewed my station and reentered the HF bands. DX chasing is my first love, and I've started fresh toward earning my DXCC award.

I want to question a practice that concerns me. Should we send DXpeditions to countries where flagrant human-rights violations occur regularly? I'm concerned that when hams collaborate with a repressive government in order to establish a DXpedition, we may appear to approve of how that government treats its citizens. In a world needing more democracy, is that the message American hams want to convey?

Our practice of mounting DXpeditions to sites controlled by repressive governments creates the appearance that radio amateurs consider narrow DX self-interest of higher priority than American principles. What principles? Among others, that democratic governments exist of, by and for their people, that peoples choose their government through open and fair elections and that a government voted out of office must step aside for the newly elected government. One paramount principle for Americans is that individual citizens have rights that even a powerful central government must respect.

Specifically, we American hams have participated in DXpeditions to Myanmar (Burma). Myanmar has a government—the State Law and Order Restoration Council (SLORC), a military dictatorship—that killed over 3000 of its citizens when it took power in 1988.

Since that time, the SLORC has continued to repress a democracy movement. The National League for Democracy, led by Aung San Suu Kyi, has sought to lead Myanmar from military rule to democracy. From 1989 to 1995, Suu Kyi was kept under house arrest. In 1991, she was awarded the Nobel Peace Prize for her efforts to bring peaceful change to her oppressed people. The SLORC allowed an election in 1990, but when Suu Kyi's party won 82% of the vote, SLORC refused to abide by the outcome and did not allow the new parliament to convene.

In 1996 the United States passed legislation that denies US entry to members of the Myanmar military regime, bans most American assistance to Myanmar and threatens to prohibit new private American investment there should the SLORC practice "large-scale repression of or violence against" the democracy movement. In November 1996, President Clinton criticized Myanmar for its involvement in the narcotics trade and its refusal to move toward democracy; both represent "the absence of the rule of law." The UK and the European Union joined the United States in criticizing the SLORC's repression.

The March 1996 *QST* featured a report about a multinational DXpedition to Myanmar, the "Golden Land." A statement in the article struck me: An objective of the trip was "to showcase Myanmar to the world." The SLORC must welcome our cooperation, for the end result makes their organization appear credible even as it continues repressing its people, jailing hundreds. In essence, we have unwittingly become handmaidens of this system, which rules its citizens with an iron fist. Is this what we want?

In my view, we American hams should not "showcase" any government, especially a government like Myanmar's. While Myanmar may be a nice place to visit, I doubt that Americans living there find much weight given to freedom of speech, press, assembly, petition, *habeus corpus*, the presumption of innocence, and all the other freedoms and rights we have defended for over 210 years. Indeed, when the SLORC violates the outcome of a national election it sponsored, when it jails its citizens and prevents them from exercising their rights, and when it kills Myanmar citizens who seek democracy, I find it most bizarre to read about "the happiness and serenity of [Myanmar's] people."

It's not just Myanmar—the matter transcends Myanmar alone. Ultimately we hams face a question: What is the right course of action when we contemplate a DXpedition opportunity? Let me advance some modest proposals:

First, we need to continue the discussion opened by this article in Amateur Radio publications and forums. Next, the ARRL, through its DXCC 2000 Committee, can develop guidelines to help us evaluate conditions in a country under consideration for a DXpedition. While guidelines could not prohibit DXpeditions to countries with questionable conditions, they can encourage American hams to carefully weigh the conditions in a country before beginning to cooperate with its government. I hope that those deciding to make a DXpedition would hold the welfare of repressed peoples at least as important as the excitement of providing another country for a DX certificate. I believe we show disrespect for the people in such countries by our willingness to overlook the conditions of their lives.

Finally, I believe we need to place our DX interests within the context of American principles. For the world and for ourselves, we must practice our principles and maintain the highest standards for our service. Let us make our choices thoughfully and publicly, following reasoned debate. In my opinion, to do less is a disservice to our proud history.

A longer version of this article appeared in the Spring 1997 *QCWA Journal*.

QST Op-Ed Policy

The purpose of Op-Ed is to air member viewpoints that may or may not be consistent with current ARRL policy.

1) Contributions may be up to two-thirds of a *QST* page in length (approximately 900 words).

2) No payment will be made to contributors.

3) Any factual assertions must be supported by references, which do not necessarily have to be included in the body of the article to be published.

4) Articles containing statements that could be construed as libel or slander will not be accepted.

5) The subject matter chosen must be of general interest to radio amateurs, and must be discussed in a way that will be understandable to a significant portion of the membership.

6) With the exception that the article need not be consistent with League policy, the article will be subject to the usual editorial review prior to acceptance.

7) No guarantee can be made that an accepted article will be published by a certain date, or indeed, that it will be published at all; however, only articles that we intend to publish will be accepted, and any article we have decided against publishing will be returned promptly.

8) Send your contributions to ARRL Op-Ed, 225 Main St, Newington, CT 06111

Silent Keys

By Kathy Capodicasa, N1GZO

It is with deep regret that we record the passing of these amateurs:

WB1CMF, Galen M. Wentworth, Danvers, MA
W1EJH, Ernest J. Martin, Bridgeport, CT
**W1HDQ, Edward P. Tilton, Spring Hill, FL
W1HW, Raymond A. St Onge, Cumberland, RI
KA1ODN, George Helmer, Riverside, CT
W1OLA, John C. Fulton, Taunton, MA
WA1PHD, G. C. Woodruff, Yarmouth Port, MA
K1RPK, Frederick M. Grover, Fremont, NH
WA1TIV, Beatrice Rand, Cape Elizabeth, ME
W1UPB, Bruce B. Adams, Lincoln, RI
W1WSK, Donald R. Eaton, Holiday, FL
WB2BZG, C. C. Herskind, Schenectady, NY
WA2DHU, Thomas M. Twist, Fair Haven, NJ
W2EIA, Herbert C. Cook, Plainview, NY
WB2HHJ, Lynford H. Rowland Sr, Whiting, NJ
W2IEK, Howard Goldberg, Commack, NY
KB2IRK, Wesley F. Gosbin Jr, Bridgeton, NJ
*W2KKM, Kenneth G. MacLean, Mesa, AZ
KD2MC, Robert F. Huether, Rochester, NY
K2MFX, John J. Sturla, Starkville, MS
*WB2NHP, James J. Freeman, New York, NY
*WB2OHP, Robert G. Cook, Plainview, NY
W2SUA, Wayne B. Wood, Sewell, NJ
W2THS, Dale M. Jahn, Bay Shore, NY
WA3CSF, Joseph P. Csensitz, Allentown, PA
W3FDW, Russell S. Schaeffer, Birdsboro, PA
WB3FOS, Paul N. Shaaber, Douglassville, PA
WA3GLG, Horace H. Ulmer, Wilmington, DE
N3HKH, H. Dean, Wellsboro, PA
W3ITH, Peter D. Nicholas Sr, Wyomissing, PA
W3OXY, D. L. Bradford, Washington, DC
WA3PYQ, Elexander C. Gribble, Ellijay, GA
N3YGB, Samuel E. Hahn, Temple, PA
KC4BZZ, Henry C. Johnston, Dalton, GA
W4CSQ, Joseph G. Talmadge, Decatur, AL
AA4ES, Dante J. Algeri, Fort Lauderdale, FL
WD4EWX, Don Wilson, Chattanooga, TN
KD4FEF, Joe M. Barnette Jr, Huntersville, NC
AA4GR, George Rulffs Jr, Westford, MA
KD4HRK, Conway S. Conard, Winchester, VA
KD4HZQ, Fred A. Berry Sr, Rogersville, TN
K4JYF, Ned K. Gressle, Herndon, VA
AE4LL, Floyd H. Jones, Trenton, FL
W4LRB, Charles W. Mc Dormand, Cape Coral, FL
W4LUR, W. M. Wallace, Sturgis, KY
N4PNE, Gordon Harrelson, Georgetown, SC
WA4QJY, Richard D. Roland, Winter Haven, FL
WD4RMS, Paul S. Dell'aria, Fairfax Station, VA
WD4RZS, George H. McAfee, Decatur, AL
W4UIR, William E. Wing, Gate City, VA
*N4WA, E. W. Terrie, Tallahassee, FL
KC4WFQ, Cecil C. Robinson, Sebring, FL
KC4YAB, William H. Barkemeyer, Macon, GA
WA4ZYI, Omega J. Wood, Roanoke, VA
KC5AYX, Marvin O. Burross, Azle, TX
*KR5C, Glenn M. Knappenberger, Hewitt, TX
KE5CU, Jack C. Campbell, Los Lunas, NM
WD5DUR, John W. Van Noy, Deming, NM
W5EUD, G. R. Williams, Farmington, NM
W5GQG, George R. Armstrong, Hartford, AR
N5JHW, Richard C. Chabot, Organ, NM
WB5JZU, Jeannine A. Dollar, Mesquite, TX
AA5PW, Janis K. Turner, Arlington, TX
W5UB, Irving S. Seligmann, San Antonio, TX
W6CXI, Gilbert B. Dippel, Redwood Valley, CA
K6EEU, Clifford L. Jackson, Santa Cruz, CA
W6EIH, Anthony T. Kaczmarek, Carson, CA
N6EPZ, C. M. Payne, Costa Mesa, CA
KB6KUC, Jerry L. Jessee, Bakersfield, CA
N6LSR, Robert J. Hurley, Aptos, CA
WB6MVI, William L. Ridenour, South San Francisco, CA
KE6OTA, Robert Abrahams, Plantation, FL
KD6QQG, Eugene W. O'rorke, Saratoga, CA
W6RZO, Robert E. Dreher, Clarks Summit, PA
*W6TOQ, Theodore J. Gradjelick Sr, Simi Valley, CA
W6WGL, Allen H. Schab, San Marino, CA
W6YCK, Joseph Aletto Jr, El Dorado Hills, CA
KF6ZD, Barry A. Vierra, Rocklin, CA
W7ADT, Bert A. Oscarson, Seattle, WA
KE7AK, Frederick P. Warrick, Sun City West, AZ
NX7A, Errol L. Duke, Wheeler, OR
W7BKM, Harold R. Schneider, Whitefish, MT
*WA7GWJ, William C. Goodloe, Seattle, WA
W7HGO, Vivian J. Bussell, Hayden, ID
N7IS, George A. Bowman, Pullman, WA
W7JXY, Leonard C. Phelps, Bremerton, WA
W7KHZ, Lyle Morrow, Mesa, AZ
AB7LR, Anthony R. Morice, Cave Creek, AZ
W7MB, George A. Wise, Portland, OR
K7NPZ, Anthony J. Pace, Yakima, WA
N7OPI, Flora L. Bowers, Santa Rosa, CA
W7OSR, Roy Peden, Bozeman, MT
WA7VBW, Francis S. Allan, Seattle, WA
W7YCO, Dean A. Hudson, Layton, UT
KA7ZHN, Robert L. Sisson, Medford, OR
W8BIP, Nick Drotar, Ravenna, OH
WB8BKB, Arthur F. Sniecinski Sr, Bay City, MI
N8EST, Harry O. Elrod, Lansing, MI
KB8JRL, Brenda S. Reagle Harper, Grand Blanc, MI
*W8JYB, Kenneth L. Noble, Rockford, MI
K8KGR, John Kurpely, Elyria, OH
K8OGH, Stanley Hooker, Cincinnati, OH
K8PSM, Paul J. Terrell, New Vienna, OH
*K8RSH, Charles C. Early Jr, North Ridgeville, OH
N8SHN, Ken Schiller, Sandusky, MI
KF8SW, Robert A. Smith, South Lebanon, OH
KA8USS, Steve Newell, Flint, MI
W8UXE, Hiram L. Phillips, Akron, OH
W8VVB, Edwin C. Bennett, Lexington, TN
WE8Y, Nicholas M. Jezich, Novi, MI
W8ZJQ, Milliard E. Hall, Elyria, OH
W9HLS, John M. Bisk, Alsip, IL
N9SWC, Burt Hofferth, Lac Du Flambeau, WI
KBØA, Clay H. Forrette, Sioux Falls, SD
WØCSQ, William W. Ritter, Wichita, KS
WØEI, Raymond W. Murtberg, Golden Valley, MN
KBØFMF, Howard D. Hebebrand, Saint Louis, MO
WØHWU, W. C. Tillotson, Cross Plains, TX
KBØICG, James R. Craig, Saint Louis, MO
WØMCN, Carl J. Heinen, Roseville, MN
WØOMI, Donald L. Lucas, Boulder, CO
KAØONN, Ron Smith, Council Bluffs, IA
WØPDH, C. L. Gillespie, Neligh, NE
NØPXL, Harley D. Decker, Newton, KS
WØQZI, Milton E. Pearson, Saint Louis, MO
WØRDC, Keith E. Harpold, Sarasota, FL
WBØTII, Edward H. Farris, Eudora, KS
KØTXU, George W. Niemi, Clear Lake, SD
KØUVH, Joseph G. Friendly, Hays, KS
*WAØZFC, Robert L. Kirchner, Calhan, CO
WØZKA, Erdice R. McCorkle, Colorado Springs, CO
WØZLB, Kenneth Schutz, Aberdeen, SD,
WØZQC, John B. Huss, Boone, IA,
VO1DI, Oscar G. Hierlihy, Manuels, NF, Canada
VE3ASO, Dennis Mungham, Mountain, ON, Canada
*VE3DEE, Melvin R. Howarth, St Catharines, ON, Canada
OA4HL, Elena Hauser, Newaygo, MI

**Charter Life Member, ARRL
*Life Member, ARRL

Note: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

Many hams remember a Silent Key with a memorial contribution to the ARRL Foundation. If you wish to make a contribution in a friend or relative's memory, you can designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund, or the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation Inc, 225 Main St, Newington, CT 06111. QST

75, 50 and 25 Years Ago

June 1922

♦ Clyde Darr, 8ZZ, again provides the cover illustration, showing an RF ammeter with drastically increasing reading, and a happy ham in the background with lots of mail. The lead editorial item relates how the ARRL Board of Directors considered making *QST* a magazine for "the man on the street," but then decided to maintain it as a magazine "of, by and for the amateur." A second topic, "Opportunity," discusses the rumors floating around—of "greatly improved radio reception methods [that are] about to arrive." Rumors that Armstrong will soon announce "super-regeneration"—of a French invention that will produce a "remarkable improvement in C.W. telegraph reception..."—of "radio frequency amplification itself." The future looks very exciting.

In "1QP—An Interesting C.W. Transmitter"—K. B. Warner tells about John Reinartz's latest transmitting circuit, and F. A. Hill, 4GL, describes "A Weagent Circuit Receiver." "The Radio Telephone Conference," also by K. B. Warner, tells of the band-plan recommendations that came out of the recent conference called by Secretary of Commerce Herbert Hoover "concerning the regulation of radio communication with particular reference to problems involved in the broadcasting of news and entertainment...."

June 1947

♦ The cover photo shows an entrant in a previous year's event as the red banner announces, "A.R.R.L. Field Day—June 14-15—1947." The editorial discusses the problem of "V.H.F. B.C.I.," and how the advent of broadcast television is making hams' harmonics problems an important issue.

For the 'phone ops, "Overmodulation Splatter Suppression," by Oswald Villard, W6QYT, explains how to get the most out of your AM modulation without generating splatter, while the CW men are treated to the description of "A New Noise-Reducing System for C.W. Reception," by Don Hings, VE7BH. G. N. Carmichael, W4GCA/9, describes his beam in "Multielement Radiators in Close-Spaced Arrays," and Richard Schellenbach, W6TKX, describes a very straightforward but effective ground-plane antenna in "An Antenna for 7-Mc. DX."

"The Dialless Converter," by James Creutz, W2PMQ, and Donald McAvoy, W2PRT, tells how a converter for the 10 and 11-meter bands can be used with a 40-meter receiver to yield improved performance, as compared to that of the typical multiband receivers of the day.

The "Thirteenth ARRL Sweepstakes Results" are presented, as are "The 13th ARRL DX Contest—High 'Phone Scores." In the "Operating News" column, it is announced that "Charlie Mellon, W1FH, is the first to qualify for the post-war DX Century Club Award." Charlie accomplished this feat over the nine-month period from March to December 1946.

June 1972

♦ That's no *ordinary* garbage can on the cover; it's WA1MRF's high-Q filter for 2 meters. A final topic in his article, "Taking Out the 2-Meter Garbage," tells how to use the filter to cook hot dogs or hamburgers. The editorial discusses "FM Channel Coordination," and the need for coordination because of the proliferation of repeaters.

"450 Cubic Centimeters of New Front End for Your Fm Receiver" describes a compact 220-MHz converter that can be built for output either at 30-50 MHz or 148-170 MHz. Jerry Sevick, W2FMI, describes "The W2FMI 20-Meter Vertical Beam," and Michael Toia, W3TQM/4 discusses "Antenna Impedance by Direct SWR Measurement." *QST*'s Novice Editor Lew McCoy, W1ICP, tells how to build "A Simple Ham-Shack Wavemeter," and, in another article discusses "CB Whip + Mod. = 2-Meter $\frac{5}{8}\lambda$ Vertical."

Thomas Riley, WA1BYM, describes "An IC Audio Tune-Up Device for the Blind Amateur." "Do You Really Dig Transistors" reprints the transistor quiz used by Wisconsin's Yellow Thunder ARC and authored by K9PKQ. In the article "Houston, This Is Apollo," authors Paul Wilson, W4HHK, and Richard Knadle, K2RIW, tell how they listen in on the Apollo spacecraft's 2287.5-MHz signals with equipment within the budget of the radio amateur.—*Al Brogdon, W1AB* QST

Contest Corral

*Edited by **Billy Lunt, KR1R** • Contest Manager*

It's almost here—Field Day arrives the fourth weekend of this month! Are *you* ready? We hope so! If you haven't gotten your Field Day Package, send for it now—or better yet, order your copy of *The 1997 ARRL Contest Yearbook*, and then you'll be set with the rules and entry forms for Field Day plus every other ARRL contest or operating event. Don't forget the ARRL June VHF QSO Party, either—right in the middle of the prime-time propagation season.

Need to brush up on your CW in time for the W1AW Field Day Message? W1AW Qualifying Runs will be at 10 PM (Eastern Time), Tuesday, June 3, and 7 PM, Wednesday, June 18. This month's West Coast Qualifying Run will be at 9 PM, Wednesday, June 4. See the W1AW schedule in this issue for details.

June

14-16

ARRL June VHF QSO Party, see May *QST*, p 111.

Asia-Pacific Sprint, 1230 to 1430Z Jun 14. Single op, single radio, SSB only, 40 and 20 meters only, 150 W max. Send RST and serial no. Work stations once/band; work Asia/Pacific stations only. QSY rule: A calling station must QSY at least 6 kHz after a QSO. Final score is QSOs × prefixes. Awards. Send entries within 7 days (or via e-mail within 72 hours) to James Brooks, 26 Jalan Asas, Singapore 678787, Singapore; e-mail **9v1yc@equator.lugs.org.sg**.

West Virginia QSO Party, sponsored by the West Virginia State ARC, 1800 to 2400Z Jun 15. Work stations once per band/mode, no repeater QSOs. WV stations send RS(T) and county; others send RS(T) and state/province/DXCC country. CW—1.810 and 35 kHz up; phone—1.860 3.860 7.260 14.260 21.360 28.360; Novices—25 kHz up. Score 1 pt/phone, 2 pts/CW QSO, and 25 bonus pts for working W8WVA. Final score is QSO pts x WV counties (max 55); WV stations use WV counties + states/provinces/DXCC countries. Add bonus pts to final score. Awards. Mail logs by Jul 15 to WV QSO Party, Dave Ellis, WA8WV, 610 Hillsdale Dr, Charleston, WV 25302; e-mail **WA8WV@aol.com**.

Portugal Day (no rules received this year), sponsored by Rede dos Emissores Portugueses, 0000 to 2400Z Jun 14. Single op, phone only. Send RS and serial no., Portuguese stations will send RS and district identifier. Score 3 pts/QSO w/DX stations and 6 pts/QSO with Portuguese or EA stations (except EA6/8/9). Mults are Portuguese districts and DXCC countries. Final score is QSO pts × multipliers. Awards. Send logs postmarked by Jul 31 to REP Award/Contest Manager, Box 2483, 1112 Lisboa Codex, Portugal.

WW South America CW Contest (no rules received this year), sponsored by *Antenna-Eletrónica Popular* magazine, 1200Z Jun 14 to 1200Z Jun 15. CW only, 80-10. Send RST and continent. Single op single/all band; multi-single single/all band; QRP all band. Score 2 pts/QSO w/own continent and country, and 10 pts/QSO w/South American stations. Count two multipliers for each different South American prefix worked. Final score is total of band scores; band scores are QSO pts × mults. Awards. Send logs to WWSA Contest Committee, Box 282, 20001-970, Rio de Janeiro, RJ Brazil.

TOEC WW Grid Contest, phone, sponsored by the Top of Europe Contesters, 1200Z Jun 14 to 1200Z Jun 15 (CW, Aug 23-24). Single op, all band/single band/low power; multi-single; multi-multi; mobile. 160-10. Send RS(T) and grid square. Work stations once/band. Score 3 pts/QSO outside your continent; 1 pt/QSO w/same continent; and 3 pts/QSO w/mobile stations regardless of continent. Multipliers are the number of two-letter grid fields (ie, EN, JP, KO, etc) worked/band. Final score is QSO pts × mults. Awards. Send logs within 30 days to TOEC, Box 2063, S-831 02 Ostersund, Sweden; e-mail **TOEC.contest@pobox.com**.

21-22

Kid's Day Operating Event, sponsored by the Boring ARC, 1800 to 2400Z Jun 21. Exchange name, age, location, and favorite color. Work stations again if operator has changed. 14.270 to 14.300 and 7.200 to 7.250. No score. All participants will receive a certificate. Send logs, comments, and funny stories to Boring ARC, 15125 SE Bartell Rd, Boring, OR 97009. For more information see **http://www.jzap.com/k7rat/**. Results will be posted at **http://www.contesting.com/kids/**.

All-Asian DX Contest, CW, sponsored by the Japan Amateur Radio League, 0000Z Jun 21 to 2400Z Jun 22 (phone, Sep 6-7). 160-10 meters. Single op single/multi band; multi-op multi-band. Work Asian stations only. No crossband QSOs. Single ops may have only one transmitted signal at any given time. Multiops may have a maximum of one signal per band. Send RS(T) and a two digit number denoting the operator's age (YL stations may send 00). Score 1 pt/QSO w/Asian stations on 7-28 MHz, 2 pts on 3.5 MHz and 3 pts on 1.8 MHz. Final score is QSO pts × different Asian prefixes (WPX rules) worked per band. Awards. Mail logs to arrive by Sep 30 (Nov 30 for phone) to JARL, All-Asian DX Contest, PO Box 377, Tokyo Central, Japan.

SMIRK QSO Party, sponsored by the Six Meter International Radio Klub, 0000Z Jun 21 to 2400Z Jun 22. 6 meters only. All phone contacts within the 48 contiguous states and Canada must be made above 50.125; only DX QSOs may be made from 50.100 to 50.125. Send SMIRK no. and grid square. Score 2 pts/QSO w/SMIRK member and 1 pt/QSO w/nonmember. Awards. Send entries by Jul 15 to Pat Rose, W5OZI, Box 393, Junction, TX 76849-0393. For more information, see **http://www.cswnet.com/~ka0nno**.

28-29

Field Day, see May *QST*, p 109.

Contest Announcements: Items for this column can be sent on a MS-DOS disk in ASCII format, via modem (860-594-0306), via fax (860-594-0259), via Internet (to **contest@arrl.org**), or in letter form. Submissions must be received no later than the 1st of the second month preceding the publication date; ie, a contest in **Sep** would have to be received by **Jul 1**.

July Events

1	Canada Day
12-13	**IARU HF World Championship**
19	South Pacific 160 Metre Contest
19	Colombian Independence Day
19-20	AGCW QRP Summer Contest
19-20	North American QSO Party, RTTY
19-20	Seanet Contest, CW
26-27	IOTA Contest

Strays

TELLING OTHERS ABOUT HAM RADIO

◊ John, W3MQD, and the Brainerd Area ARC (in Minnesota) recently placed a display in their local library, which was being used at the time for the club's meetings. The club's display included a selection of unusual QSL cards, including one inscribed with an awl on a cut-open juice can, and ARRL materials.

HAM RADIO CLASS RING

◊ Carolina, KF6FNS, recently bought her senior class ring, and elected to have a radio and a mike engraved in the two sides of the ring to show her ham radio interest. She is a student at John F. Kennedy High School in Granada Hills, California. (Tnx to Robert, N6NBF, woodworking technology instructor at Kennedy High, for passing this info along.)

BOY SCOUTS ON ATV

◊ Last fall, two groups of Boy Scouts were enjoying outings in Nevada—one group at Nellis AFB and the other in Henderson, 18 miles distant. Some local hams showed them ATV at work, with the Scouts seeing one another via 434 MHz ATV. Thanks to the following hams for a job well done: Steve, KD8S, at the Henderson end; Tony, W1EWC, and John, KI7VT, at Nellis AFB; and Serge, WA6BJV, assisting from his home station.

WORKING ALASKA, THEN AND NOW

◊ One of the most exciting contacts Tom, W4YOK, remembers from his Novice days took place on May 13, 1953. Fifteen-year-old Tom had been a Novice for four months in Henderson, Kentucky. Tom fired up his Eldico TR-75-TV and Hallicrafters S-38B on 40 meters and called a CQ on his trusty J-38 key. He heard a weak signal come back through the QRN, and copied W_7AVP. Tom was excited to hear the call sign, since he had never worked the seventh call area before. A QRZ? call brought the caller back, and this time Tom copied WL7AVP, a Novice in *Fairbanks, Alaska!* Tom says that, when the QSL card arrived a week later, his mother told him she never saw him so happy.

Then, 43 years later, Tom fired up his rig to participate in the 1996 ARRL 160 Meter contest. He isn't really a contester, but he was searching for Alaska to complete his 160 meter WAS—having had 49 states confirmed on 160 for 22 years. Although Tom says he's "getting too old to stay up all night," he hung in there until 0530 UTC, when he heard KL7RA (in Fairbanks). Tom fired up his 833A amplifier and threw in "W4YOK." And KL7RA came back immediately! Tom says that when the adrenaline finally stopped pumping two hours later and he went to bed, his wife told him she never saw him so happy.

By **Billy Lunt, KR1R**
Contest Manager

1997 ARRL 10 GHz and up Cumulative Contest Rules

Object: To promote amateur microwave activity.
Region: North America.
Eligibility: Licensed amateurs operating in the above region.

1) **Object:** To work as many amateur stations in as many different locations as possible from as many locations as desired from 10 GHz through light.

2) **Contest Period:** 8 AM to 8 PM local Saturday and 8 AM to 8 PM local Sunday for the weekends of August 16-17 and September 20-21, 1997.

3) **Categories:**

A) 10 GHz only.

B) 10 GHz and up.

4) **Exchange:** Six-character Maidenhead Locator (see *QST*, Apr 1994, p 86, or write to Special Requests at HQ for a reprint). Signal report is optional.

5) **Miscellaneous:**

A) Scheduling contacts is both permissible and encouraged.

B) Stations are encouraged to operate from more than a single location. For purposes of the contest, a change of location is defined as a move of at least 16 km (10 miles). A station may be reworked on each band for additional credit by either end of the contact moving to a new location.

C) Contacts may not be duplicated on the second weekend (that is at least one end of the QSO must be from a different location).

D) Contacts must be made over a minimum distance of 1 km.

E) A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period. The intent of this rule is to prohibit "manufactured" contacts.

F) Contacts with aeronautical mobiles do not count.

6) **Scoring:**

A) *Distance points*: The distance in km between stations for each successfully completed QSO is calculated.

Distance = distance in km.

B) *QSO points*: Count 100 QSO points for each unique call sign worked per band. Portable indicators added to a call sign are not considered as making the call sign unique.

C) *Total Score*: Equals distance points plus QSO points.

D) There are no multipliers.

E) In making the distance calculations, a string (or ruler) and map may be used. However, calculations by computer program are preferred. Several such programs are available in the commercial market, including a basic program listing in *The ARRL World Grid Locator Atlas* ($5). For purposes of making calculations, stations are defined as being located in the center of the six-character locator sub-square (most computer programs make this assumption).

F) *Scoring example*: On the first weekend, W9JJ, operating from Mt Greylock, Massachusetts, works W1VD (distance 97 km) and W1LJ/1 (distance 107 km) on 10 GHz, and W1LJ/1 (distance 107 km) on 24 GHz.

On the second weekend, W9JJ/1, operating from Pack Monadnock, New Hampshire, works W1VD (154 km), W1VT (205 km), W1LJ (157 km), and K1RO (147 km) on 10 GHz; and K1RO (147 km) on 24 GHz.

Distance points = 97 + 107 + 107 + 154 + 205 + 157 + 147 + 147 = 1121

QSO points = 100×6 = 600 (10 GHz: W1VD, W1LJ, W1VT, K1RO; 24 GHz: W1LJ, W1RO)

Final Score = 1121 + 600 = 1721

7) **Scheduling and Reporting:**

A) Schedules may be set up by use of the HF calling frequency of 3818 kHz on the evenings of Tuesday, Wednesday and Thursday before the contest weekends starting at 7 PM local. Also, 144.230 and 146.55 MHz can be monitored during the contest to arrange schedules with other stations. Paired stations should move off these frequencies once contact has been made.

B) Logs should indicate band, date, time, call sign, the exchange information plus distance of contacts in km.

C) Logs must be submitted no later than 30 days after the end of the contest to the ARRL Contest Branch, 225 Main St, Newington, CT 06111.

8) **Awards:** Suitable awards will be presented.

9) **Disqualification:** See the Contest Disqualification Criteria. These criteria are published annually in *The ARRL Contest Yearbook*, and were last published in *QST* in the August 1995 issue (page 118). QST

Special Events

*Edited by **Billy Lunt, KR1R** • Contest Manager*

Glasgow, KY: KY4X, 1400-2100Z **Jun 7**, Highland Games. General 20 and 40. Certificate. KY4X, Box 23, Summer Shade, KY 42166.

St Cloud, MN: St Cloud ARC. WØSV/75, 0000-2400Z **Jun 7**, Club's 75th anniversary. 3.875 7.275 14.275 21.375. Certificate. WØSV, St Cloud ARC, 401 4th St N, Waite Park, MN 56387.

Bowling Green, KY: Western Kentucky DX Assn. KB4ALC, 0000Z **Jun 7** to 2400Z **Jun 8**, Corvette Homecoming. 3.860 7.235 14.235 21.310. Certificate. Kenneth E. Newman, KB4ALC, 505 Emmett Dr, Bowling Green, Ky 42101.

Baltimore, MD: Historical Electronics Museum ARC. W3GR, 1400-2100Z **Jun 7-8**, Normandy invasion on D-Day. General 10-40. Certificate. HEMARC, W3GR, c/o Historical Electronics Museum, MS 4015, Box 746, Baltimore, MD 21203.

Mississauga, ON: Mississauga ARC, VE3MIS, 1300-2200Z **Jun 7-8**, 25th Streetsville Founders Bread and Honey Festival. 3.930 7.230 14.240 18.130. QSL. MARC, Michael Brickell, VE3TKI, 2801 Bucklepost Cresent, Mississauga, ON L5N 1X6, Canada.

Des Arc, AR: North Central Arkansas ARS, **Jun 13-14**, Steamboat Days. General 20 15 10. Certificate. NCAARS, Box 911, Judsonia, AR 72081-0911.

Fulton, NY: Oswego County ARES, KY2F, 1200-2100Z **Jun 14**, Young Eagles Day. General 80 40 20 15. Certificate. Fred Swiatlowski, KY2F, EC, Oswego County, 316 W 5th St, Oswego, NY 13126.

Steubenville, OH: Steubenville Weirton ARC. W8CWO, 1500-2200Z **Jun 14-15**, Ft Steuben Bicentennial. 7.270 14.270 28.470. Certificate. Bill Leist, WA8DRL, 2444 Alexander Manor E, Steubenville, OH 43952.

Rochester, NY: Rochester DX Assn, W2RDX, **Jun 14-30**, 50th Anniversary. 7.025 14.025 14.200 14.225. QSL. Irv Goodman, AF2K, 515 Drumm Rd, Webster, NY 14580

Laurel, MD: Laurel ARC, W3DAD, 1200-2400Z **Jun 15**, Fathers Day. General 75 40 20 10. Certificate. Laurel ARC, Box 3039, Laurel, MD 20709.

Kansas City, MO: NE Kansas City ARC, KBØSYC, 1400Z **Jun 19** to 2000Z **Jun 28**. Intercollegiate Competition for solar-powered cars. 14.260 28.325. Certificate. NE Kansas City ARC, KBØSYC, Larry Adreme, 139 S Cypress Ave, Kansas City, MO 64123.

Bell Buckle, TN: Middle TN ARS, W4UOT, 1300-2100Z **Jun 21**, 3rd Annual RC Cola & Moon Pie Festival. 3.980 7.240 14.238. Certificate. W4UOT, Gerald L. Ewell Sr, N4GE, 809 Parks St, Manchester, TN 37355.

Wellsboro, PA: Tioga County ARC, WO3C, 1400Z **Jun 21** to 1800Z **Jun 22**. Amateur Radio Awareness. 3.860 7.250 14.250 28.375. Certificate. Darlene Rahn, RR 6, Box 200, Wellsboro, PA 16901-8972.

West Hampton, NY: Suffolk County ARES/RACES, AC2P, 1400Z **Jun 21** to 1900Z **Jun 22**. Wings Over Long Island Air Show. General 80-10. Certificate. Rich Tygar, AC2P, 5 Chemsford Dr, Wheatley Heights, NY 11796.

Vancouver, WA: Clark County ARC, W7AIA, 1600Z **Jun 21** to 2400Z **Jun 22**. Pearson Air Museum and 60th Anniversary of Russian Transpolar Flight. General 80-15 and Novice 10. Certificate. CCARC, 4211 NE 140th Ave, Vancouver, WA 98682.

Fairhaven, MA: SEMCARES, AA1FS, 0800Z **Jun 27** to 0800 **Jun 28**. American Cancer Society Relay for Life. 3.870 7.230 14.260. Certificate. Semcares Relay Special Event, Box 80007, South Dartmouth, MA 02748.

Flint, MI: Amatuer Radio and Youth, WA8RAY, 1400Z **Jun 28** to 1800Z **Jun 29**. The ARAY 10th Anniversary. 3.925 7.275 14.275 21.375. QSL. ARAY, KG8IM, Box 7136, Flint, MI 48507.

Special Events Announcements: For items to be listed in this column, you must be an Amateur Radio Club, and use the ARRL Special Events Listing Form. Copies of this form are available via the Internet (**info@arrl.org**), the ARRLWeb Page (**www.arrl.org**), the ARRL BBS (860-594-0306), or for a SASE sent to Special Requests, ARRL, 225 Main St, Newington, CT 06111 (write "Special Requests Form" in the lower left-hand corner of the envelope). Entries must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; ie, a special event listing for **September** *QST* would have to be received before **Jul 1**. Entries may be sent on an MS-DOS floppy disk in ASCII format; fax at 860-594-0259; via modem (860-594-0306); via Internet (**contest@arrl.org**); or in letter form. QST

1997 ARRL January VHF Sweepstakes Results

By **Billy Lunt, KR1R**
Contest Manager

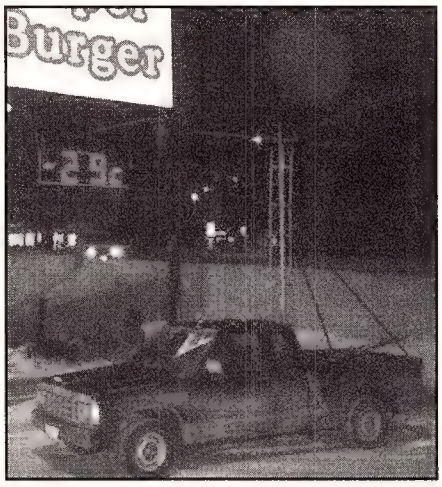
Despite average propagation conditions, high levels of activity made this contest fun from start to finish. You can always count on lots of activity in the January VHF Sweepstakes. Our ARRL Affiliated Clubs see to that. Typically, the January VHF SS attracts 300 to 500 more entrants than the June or September VHF QSO Parties. Clubs have a way of enticing casual operators to get on the air during the contest—with whatever equipment they may have. Even if the only VHF equipment that is available to you is a 2-meter FM transceiver, the bands are usually buzzing with activity on the simplex channels, especially in the local areas near large VHF contest clubs. A scan through the score listings will show you lots of entries with low to average scores. These are the casual operators. In the areas where you can find lots of casual operators, you can surely count on an active VHF contest club being nearby. If you are in one of these areas and don't belong to the local club, you should contact them. Clubs offer a wealth of resources—operating help, equipment information, antennas and propagation advice, etc. But most of all, clubs offer camaraderie among the members and lots of operating fun. If your club isn't filling the bill by getting the casual operators active in the contest, you should experiment with some new techniques to encourage your members to try VHF contesting. More activity makes for more fun—and larger scores.

Rovers are another entity that contributes to the overall fun of the contest. This year's VHF SS attracted quite a few rovers despite the unusually cold and stormy weather. With the lack of enhanced band conditions, and when nearby grid square multipliers are hard to come by, rovers offer us those much appreciated grid square multipliers, especially on the microwave bands. Rovers add *doubly* to your club's aggregate effort—contacts for you, and contacts for the rover. This only translates to larger club scores. Hats off to all the rovers! Their presence and efforts don't go unrecognized.

Our rotators were frozen several times during the weekend, but we were warm and toasty in the shack. Thanks to N2WK's XYL for the great food. We used our new Rochester VHF club call sign in memory of our founder Hank Blogett, W2UTH. Shown (l-r) are Mark, KA2RDO; Paul,W2PJ; Frank, K2OS; and Dave, K2DH. Rus, NJ2L, is to the left, in the background.

It's not just activity that makes a contest interesting and fun—a band opening or two surely helps. Did you catch the short opening on 6 meters? Yes, there were actually *two* short 6-meter openings—one on Saturday night and one on Sunday morning, about an hour each. There wasn't much of any other band enhancements reported—a little meteor scatter and that was about it. This was definitely an average January contest.

Did you work any EME? This year the January EME Sked Weekend was on the same weekend as our contest. A few stations reported making EME QSOs into Europe—K1FO, WB2DNE and N4UK. Any others? This is one mode you want to watch. If you can catch a moonrise or moonset, you just might pick up a new multiplier or two.



Russell, VE3OIL, says, "The contest was on the coldest weekend of the year (notice the –29° C sign). The 1296 plastic antenna mounting, used for several June contests, shattered in the cold. The 432 antenna broke while cleaning ice off of it; I had to hot-wire it back to life. At one point the 2-meter amp took off into audio-frequency oscillation that I could hear, but a couple of thumps set it straight. The 6-meter transverter failed and needed encouragement. The only thing I couldn't work around was the truck. The picture is from the south end of EN94 shortly before the truck started misfiring and not providing enough power to pull itself. It had to be towed to the garage, causing much work and significant changes in my plans. The problem was determined to be probably a cold-induced intermittent in the fuel pump. It hasn't given me a problem since then—I may replace it in the warmer months, or I may not. I may attempt roving again next January, but only if it stays warm, say above –10° C."

AA4ZZ operated 144 MHz in the mountains of NC from his Jeep.

Top Ten

Single Operator

WA8WZG	467,712
WA2TEO	364,000
WC2K	276,937
WA3AXV	262,080
AA2UK	231,972
WZ1V	222,384
W2FU	188,800
K1RZ	188,649
WA3NUF	177,862
KD1DU	170,291

QRP Portable

W8TL/3	49,818
NS6X	37,920
W1VT	25,168
KK6KE	17,874
KC8BUN	15,879
N8KH	7,130
N8XA	5,781
N9TZL	3,683
W6ZN	3,553
XL2PIJ (VE2PIJ,op)	2,160

Multioperator

K3MQH	653,034
W2UTH	495,288
N2ODK	299,296
W8ULC	159,344
K1WHS	153,672
K2TVI	152,320
WA2AAU	132,225
W3IP	118,708
WØRSJ	115,884
WA2OMY	108,290

Limited Multioperator

N2XTX	180,495
N4UK	149,112
NC1I	99,086
W1QK	92,367
NO2T	88,827
N6RMJ	60,512
WB1FLD	56,602
N2VOT	53,418
K1MUJ	38,847
K3CT	36,946

Rover

AB4CR	143,606
NR1L	109,368
NC7K	82,820
KB3PW (+N2HKD)	68,187
WO2P	37,760
KA2CKI	34,408
N2KXS	29,055
KJ1K(+N1MU)	26,977
WB5VYE (+WA5ZKO)	17,836
N3KKM (+N3XUD)	16,744

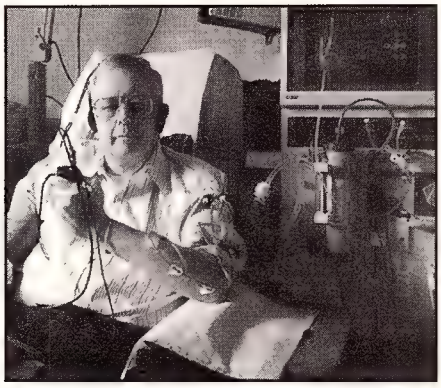
How I Worked Five Grids on Sixteen Bands

By John Kitchens, NS6X

A nonham friend works in a satellite communication division of Hughes. He thinks I am a bit crazy for what I do. He does this stuff for a living, so he really doesn't understand why I find this stuff "fun." I guess it is more of the challenge of the hunt, than the competition that I enjoy—conquering something that I was told would be impossible to do. He can't tell me what he does (top secret job and all...), but I knew he has some expensive test equipment. I made arrangements to borrow some of it. I didn't pay too close attention to the equipment I was using, but it was essentially a signal generator and frequency counter, attached to 5-foot dishes, for all bands above 24 GHz. For the other bands, I used an FT-736 for 144 through 1296 MHz, Downeast transverters for 2.4 through 5.7 GHz, and Gunnplexers for 10/24 GHz. Several lasers were used with photomultipliers for receivers, as designed by Steve Noll, WA6EJO.

Los Angeles is a series of hills, with a grid intersection smack in the middle of the metropolitan area. I parked in the corner of one grid and worked my daughter, KB6JVV, on all bands. I then moved to each of the other three grids, in turn, working her again from each one. Then I drove to a more remote location for the fifth grid. That was it. Simple operation, mag mounts for 50 to1296 MHz, two dishes, Gunnplexers, and photomultipliers for receivers. I practiced with the equipment all day Friday, the day before the contest, to make sure I understood how it all worked, and to avoid destroying over a quarter-million dollars of "test" equipment.

For the first QSOs, we were practically next to each other. For the next three, I went with her to help set up the equipment, and then returned to my location to make the QSOs. For the QSOs from the final location, she set up by herself. She had never done that before, making it even more of a feat. I just wish there were some VUCC-type award she could receive for the effort she put in, something ol' dad could give. I enjoy the family nature of the way I have operated within the hobby. I have two more daughters to get licensed—just need to get some time with them, maybe this summer. They are 12 and almost 10 years old.



Ric, K3QQ, tells us, "The contest fell on the same day as my Hemodialysis session." This didn't stop Ric. He had a QSO rate of 2.4 per hour.

The score boxes tell the whole story on what the top stations did in each category. Take a few minutes to look over the standings, especially the region boxes that detail the local competition.

One thing for sure that we want to mention is that there were two overall score records set in this year's competition: WA8WZG set a new single operator record at 467,712 points, and K3MQH set a new multioperator record at 653,034 points. Great going! There were also 18 division records set: Single operators—WC2K, N2BJ, WA8WXG, WA2TEO, and NØEC. QRP portables—W8TL/3, N9TZL, KC8BUN, KK6KE, NS6X, and XL2PIJ (VE2PIJ,op). Multioperator—K3MQH. Limited multioperators—WA6KLK, N4UK, and VE3TMG. Rovers—AB4CR, NC7K, and W3EKT. *The 1997 ARRL Contest Yearbook* has all the contest records in it. ARRL Publications are available from your local ARRL dealer or directly from the ARRL. Mail orders to Publication Sales Dept, ARRL, 225 Main St, Newington, CT 06111-1494. You can call us toll-free at 888-277-5289; fax your order to 860-594-0303; or send e-mail to **pubsales @arrl.org**. Check out the full ARRL publications line on the World Wide Web at **http://www.arrl.org/catalog**.

In the ARRL Affiliated Club Competition, the three gavel winners finished comfortably ahead of their competition. The Mt Airy VHF Radio Club easily took the unlimited category, with 2.8 million points. The North East Weak Signal Group took the medium category, with 2.2 million points, and the Delaware Valley VHF Society won the local category, with 136k points.

As you read these results, it'll be time to start getting ready for Field Day and the June VHF QSO Party. Don't forget about the VHF/UHF activity in Field Day. See May *QST* for details. Special thanks to Administrative Assistant Sharon Taratula for her help in preparing the results.

Northeast Region (New England, Hudson and Atlantic Divisions; Maritime and Quebec Sections)

WA2TEO	364,000	S	K2UOP/8	81,270	S	WA8WZG	467,712	S	NØHJZ	92,456	S	WB5OMF	29,696	S
WC2K	276,937	S	K9OYD/4	54,800	S	KE8FD	167,800	S	WAØBWE	50,688	S	W3SE	18,330	S
WA3AXV	262,080	S	KC4QWZ	49,569	S	WA8NJR	161,980	S	NØEC	34,680	S	N6KBX	16,170	S
AA2UK	231,972	S	K4QI	48,120	S	N2BJ	149,641	S	KBØIKP	33,200	S	N6AJ	15,792	S
WZ1V	222,384	S	N4KWX	38,367	S	KU8Y	111,706	S	WQØP	32,476	S	KC6ZWT	15,680	S
W8TL/3	49,818	Q	KE4QLH	36	Q	KC8BUN	15,879	Q	NØWCB	588	Q	NS6X	37,920	Q
W1VT	25,168	Q				N8XA	5,781	Q	KGØZT (EN33)	322	Q	KK6KE	17,874	Q
XL2PIJ (VE2PIJ,op)	2,160	Q				N9TZL	3,683	Q	KBØYAE	322	Q	N8KH	7,130	Q
N2UM	1,332	Q				N9KXE	148	Q	NØVUQ (EN33)	110	Q	W6ZN	3,553	Q
N1MUV	424	Q				KE4PZT	12	Q	NØVUR (EN33)	105	Q	KE6GFI	2,010	Q
K3MQH	653,034	M				W8ULC	159,344	M	KB5IUA	26,925	M	KC6UCN	19,140	M
W2UTH	495,288	M				VE3BFM	9,555	M	KB5UBE	15,280	M	WA6YDI	18,444	M
N2ODK	299,296	M							AC6IO	1,554	M	KØBGL	8,028	M
K1WHS	153,672	M										KB7UWC	5,418	M
K2TVI	152,320	M										W6TRW	4,906	M
N2XTX	180,495	L	N4UK	149,112	L	WA8BCA	34,207	L	WD5AGO	13,035	L	N6RMJ	60,512	L
NC1I	99,086	L	NG4C	18,630	L	WD9EXD	30,240	L	KFØM	9,296	L	WA6KLK	14,147	L
W1QK	92,367	L	KF4KVH	6,580	L	NI9E	27,594	L	KGØWA	9,288	L	W6TOI	12,800	L
NO2T	88,827	L	KD4ZMR	5,822	L	K8EB	17,226	L	WA5VKS	7,689	L	KI6FF	8,649	L
WB1FLD	56,602	L	WD4GSM	4,532	L	VE3TMG	12,688	L	KA5BOU	6,601	L	WA7IQH	2,660	L
NR1L	109,368	R	AB4CR	143,606	R	N9UIZ	13,414	R	WB5VYE (+WA5ZKO)	17,836	R	NC7K	82,820	R
KB3PW (+N2HKD)	68,187	R	KF4OHL	10,556	R	N9VZX	11,820	R	N5VBK	10,549	R	KB6JVV	9,870	R
WO2P	37,760	R	W3EKT	8,778	R	N9SFN	11,100	R	KK5RH (+KD4JDT)	10,300	R	K6LMN	9,436	R
KA2CKI	34,408	R	N8ZCA (+KB8RXC)	6,633	R	N8KWX	8,748	R	NK5F	6,897	R	KM6RH	5,797	R
N2KXS	29,055	R	KF9US	4,368	R	K9JK	5,876	R	NØMWH	5,694	R	KE6BZY	5,404	R

Affiliated Club Competition

	Score	Entries
Unlimited Category		
Mt Airy VHF Radio Club	2,893,897	57
Northern Lights Radio Society	498,443	56
Rochester (MN) ARC	17,685	55
Medium Category		
Northeast Weak Signal Group	2,212,377	46
Rochester VHF Group	1,576,455	46
Potomac Valley Radio Club	280,106	7
Badger Contesters	260,764	42
Murgas ARC	176,495	5
Western States Weak Signal Soc	148,399	12
South Jersey Radio Assn	72,368	17
Rocky Mountain VHF	65,721	5
Six Meter Club of Chicago	62,693	33
Schenectady ARA	59,321	16
Quaboag Valley ARC	40,718	7
Downey ARC	36,060	8
Crawford ARS	34,966	16
Society of Midwest Contesters	21,589	3
Keystone VHF Club	21,568	3
Troy ARA	19,332	7
Northern California Contest Club	16,736	4
Granite State ARA	13,297	4
Xerox ARC	12,235	10
Northern New York Contest Club	3,618	3
Mobile Sixers Radio Club	2,841	7
Local Category		
Delaware Valley VHF Society	136,757	6
North Shenandoah DX Assn	96,844	3
Bergen ARA	91,540	5
Hudson Valley Contesters and DXers	74,842	3
Overlook Mountain ARC	67,114	5
Warminster ARC	57,070	22
North Texas Microwave Society	52,282	7
Wheaton Community Radio Amateurs	34,037	9
Hilltop Transmitting Assn	25,763	3
Albany ARA	19,518	4
Drumlin ARC	12,660	8
Delaware Valley OMIK Electronics Comm Assn	8,773	3
Palo Alto ARA	5,120	3
Huber Heights ARC	3,870	5
Nittany ARC	239	3

QSO Leaders by Band

Single Operator

50 MHz

WA2WQZ	262
K9PW	247
N1MIA	244
W3EP	224
KU8Y	221
WA2TEO	219
K1TR	218
W0UC/9	205
AA9AO	197
K1RZ	185
AJ1X	178
N1MHH	164
N2BJ	163
WZ1V	162
WC2K	161

144 MHz

KD1DU	435
WA2TEO	413
WB2QOQ	364
K3UZY	330
WC2K	322
K1RZ	314
N2BJ	304
N3FUJ	287
WA3NUF	261
WA4GPM	259
N3JDQ	257
K9MRI	254
WB3KRW	252
WB2CUT	251
AA2UK	251

222 MHz

WA3AXV	118
WC2K	109
WA2TEO	108
WB3KRW	94
WA3NUF	94
WB3JYO	94
N3EXA	93
WA8WZG	91
WZ1V	85
AA2UK	85
N2SB	80
K1RZ	80
KD1DU	79
N2BJ	78
WB2YEH	76

432 MHz

K1FO	254
WA2TEO	157
WA8WZG	149
K7JA	142
WA3AXV	139
WZ1V	127
N3FUJ	127
N2BJ	126
KE6GFF	126
K1RZ	121
WC2K	119
WA3NUF	118
WB3JYO	116
WB3KRW	115
W2FU	111

902 MHz

WA2TEO	49
WA3AXV	49
N3EXA	45
WA3NUF	44
W2UR	43
AA2UK	42
WB3JYO	41
WC2K	41
WZ1V	40
WB2YEH	40
WA8WZG	40
N2SB	38
W2FU	37
W3KM	36
W2SK	36

1296 MHz

WA8WZG	65
WA3AXV	64
AA2UK	63
WA3NUF	60
WB3JYO	54
WC2K	53
N3EXA	53
WB3KRW	53
W2UR	52
WB2YEH	49
WA2TEO	48
WZ1V	45
W3KM	45
N1DPM	44
N2SB	41

2304 MHz

WC2K	48
WA8WZG	32
WA3AXV	31
WA3NUF	28
AA2UK	27
N3EXA	26
WA2TEO	24
WB3JYO	23
W2SK	22
WZ1V	22
W2UR	22
WB2YEH	21
N2SB	21
W3KM	19
N1DPM	18
W1MBA	18

3456 MHz

WA3AXV	18
WA3NUF	16
WB3JYO	14
N2SB	14
WA8WZG	13
KB3XG	12
W2SK	12
W2UR	11
W1MBA	11
WB2YEH	10
N1DPM	9
AA2UK	8
N3AOG	8
WZ1V	6
W2FU	4
N0HJZ	4
KB2HQ	4

Multioperator

50 MHz

K3MQH	462
WA8BCA -L	433
K2TVI	354
N2XTX -L	292
K1WHS	284
W0RSJ	242
W1QK -L	227
W2UTH	223
N2ODK	216
N4UK -L	183
K3EOD	179
W8ULC	154
N2VOT -L	149
NO2T -L	142
WA2OMY	137

144 MHz

K3MQH	847
W2KV -L	526
NO2T -L	465
K3EOD	427
W2UTH	404
N2XTX -L	403
K2TVI	356
NC1I -L	342
W1QK -L	326
W0RSJ	324
N2ODK	294
K3CT -L	277
W3IP	271
WA2OMY	260
W8ULC	258

222 MHz

K3MQH	198
W2UTH	127
N2ODK	111
K2TVI	103
K3EOD	86
WB2PSI	83
WA2OMY	78
K1MUJ -L	69
W1QK -L	69
N2VOT -L	68
W8ULC	65
NO2T -L	60
K3DMA	60
WB1FLD -L	58
W0RSJ	57

432 MHz

K3MQH	333
NC1I -L	222
W2UTH	176
N2ODK	156
NO2T -L	147
K2TVI	138
K3CT -L	133
W1QK -L	121
W3IP	116
K3EOD	107
W8ULC	104
WB2PSI	100
WB1FLD -L	91
N4UK -L	90
N2VOT -L	90

902 MHz

N2ODK	40
W2UTH	38
WA2AAU	30
WA2OMY	26
W3IP	22
K3EOD	21
WB2PSI	21
N3ADC	20
K3MQH	18
K1WHS	16
N1BWT	15
W8ULC	12
K2TVI	10
W0RSJ	7
WA3U	7

1296 MHz

W2UTH	53
N2ODK	45
W3IP	43
WA2AAU	37
WA2OMY	33
K3MQH	32
WD5AGO -L	28
WB2PSI	26
N3ADC	25
K1WHS	24
K3DMA	24
KC6UCN	23
K2TVI	22
K3EOD	21
W0RSJ	20

2304 MHz

W2UTH	23
WA2AAU	19
N2ODK	17
WA2OMY	14
W0RSJ	11
K1WHS	10
WB2PSI	7
W3IP	6
K2TVI	3
VE3BFM	3

3456 MHz

W2UTH	12
WA2AAU	9
W0RSJ	3
N2ODK	3
WA2OMY	1

-L denotes Limited Multioperator

Multiplier Leaders By Band

Single Operator

50 MHz

K9PW	59
W3EP	54
WA2TEO	53
W0UC/9	52
K1TR	52
AF1T	52
W1AIM	52
KU8Y	51
N0LL	51
AA9AO	48
K0GU	46
WA8NJR	46
KM1X	45
WZ1V	44
WA2WQZ	44

144 MHz

KE8FD	55
KA9QFL	51
KB9IEC	51
K9MRI	51
K8TQK	47
K3UZY	47
WA2TEO	46
AA4ZZ	45
WA8NJR	45
WA4GPM	44
WA8WZG	44
VE3KDH	43
K1RZ	43
K4QI	43
WZ8T	42

222 MHz

KE8FD	40
WA8WZG	34
K9MRI	32
WA8NJR	31
WA2TEO	29
K4TO	26
AA2UK	25
K8TQK	25
WC2K	24
K1RZ	24
WZ8T	24
KU8Y	23
N2BJ	23
WZ1V	23
WB2DNE	22
W0UC/9	22
K2YAZ	22
WB3KRW	22
W2FU	22

432 MHz

K1FO	58
K4QI	52
WA8WZG	45
KE8FD	41
K9MRI	33
WA2TEO	32
K0RZ	32
N2BJ	32
AA2UK	31
KB9IEC	31
K2YAZ	31
KC4QWZ	31
W2FU	31
WA8NJR	30
W3OR	30
K8TQK	30
WA4GPM	30

902 MHz

WA2TEO	20
WA8WZG	19
WC2K	16
WA3AXV	14
K2UOP/8	14
WZ1V	14
AA2UK	14
W3OR	14
W1MBA	14
KD1DU	14
N1DPM	14
W2FU	13
W2UR	12
WA2FGK (K2LNS,op)	12
K1RZ	12

1296 MHz

WA8WZG	30
K4QI	25
AA2UK	19
WA8NJR	18
KE8FD	17
WC2K	17
WA2TEO	17
K2UOP/8	16
WA3AXV	16
W3OR	16
WZ1V	14
WB3KRW	14
W2FU	14
W1MBA	14
WA2FGK (K2LNS,op)	14
WA3NUF	14

2304 MHz

WA8WZG	19
WC2K	11
WA2TEO	10
N1DPM	9
W1MBA	9
WZ1V	8
WA3AXV	7
AA2UK	7
W2FU	6
WA3NUF	5
K2AN	5
WA1YHO	5
N1LZC	5
N3NGE	4
AA2WV	4
W2UR	4
AF1T	4
N0HJZ	4
WA2FGK (K2LNS,op)	4
N3EXA	4
N2SB	4
K1TR	4
N2ULL	4
WB1FKF	4

3456 MHz

WA8WZG	9
W1MBA	7
N1DPM	5
N0HJZ	4
W2FU	3
N2SB	2
WZ1V	2
NA1W	2
KB3XG	2
W2SK	2
W2UR	2
N3AOG	2
KB2HQ	2
AA2UK	2
WA3AXV	2
WA3NUF	2
WB3JYO	2
AA2WV	2
WB1FKF	2
WB2YEH	2

Multioperator

50 MHz

N4UK -L	84
WA8BCA -L	79
K1WHS	69
K3MQH	69
N2XTX -L	62
W2UTH	47
N2VOT -L	40
W8ULC	40
N2ODK	39
W1QK -L	39
N1BWT	38
WB1FLD -L	37
W0RSJ	36
K2TVI	35
NG4C -L	34
K3EOD	34

144 MHz

N2XTX -L	64
K3MQH	64
N4UK -L	59
W8ULC	57

222 MHz

K3MQH	43
W2UTH	37
W8ULC	34
N2ODK	32
N4UK -L	31
N2XTX -L	30
N6RMJ -L	24
WD9EXD -L	22
WB2PSI	20
K1WHS	18
NO2T -L	17
K1MUJ -L	17
W3IP	17
WA2AAU	16
W1QK -L	16

432 MHz

N4UK -L	54
K3MQH	52
NC1I -L	46
W8ULC	41
W2UTH	37
W2UTH	48
W2KV -L	47
WD9EXD -L	47
N2ODK	42
NI9E -L	36
W3IP	35
N6RMJ -L	34
W0RSJ	32
NO2T -L	31
NC1I -L	30
K3CT -L	30

902 MHz

N2ODK	16
WA2AAU	14
W2UTH	12
K3MQH	11
W3IP	8
WB2PSI	7
W8ULC	6
K1WHS	6
K2TVI	6
N1BWT	6
WA2OMY	5
WA3U	4
N3ADC	4
VE3BFM	3
W0RSJ	2
KB5UBE	2
KB5IUA	2
K3EOD	2

1296 MHz

WD5AGO -L	23
N2ODK	15
W2UTH	15
K3MQH	15
WA2AAU	14
K2TVI	10
N2XTX -L	33
N6RMJ -L	33
N2ODK	32
W3IP	25
WB2PSI	25
K3CT -L	23
K1WHS	21
KF0M -L	20
W0RSJ	19
K1MUJ -L	19

2304 MHz

WA2AAU	11
N2ODK	7
W2UTH	6
K1WHS	6
WB2PSI	5
W0RSJ	4
W3IP	3
K2TVI	2
WA2OMY	2
VE3BFM	1

3456 MHz

W2UTH	4
WA2AAU	4
N2ODK	3
WA2OMY	1
W0RSJ	1
W3IP	9
KG0WA -L	9
KB5IUA	7
K1WHS	7
W8ULC	6
K1MUJ -L	6
WB2PSI	6
KA5BOU -L	6
KC6UCN	5
KB7UWC	5
WA2OMY	5
N1BWT	5

-L denotes Limited Multioperator

Scores

Each line score lists call sign, score, stations worked, multipliers, band (A = 50 MHz, B = 144 MHz, C = 222 MHz, D = 432 MHz, 9 = 902 MHz, E = 1296 MHz, F = 2304 MHz, G = 3456 MHz, H = 5760 MHz, I = 10 GHz, J = 24 GHz, K = 47 GHz, L = 75 GHz, M = 119 GHz, N = 142 GHz, O = 241 GHz, P = 300+ GHz), and number of grid squares activated (if rover). Division leaders are listed in **bold** print.

USA

1

Connecticut

WA2TEO	364,000	1019	208	S	**ABCD9EFG**
WZ1V	222,384	693	164	S	ABCD9EFG
KD1DU	170,291	839	137	S	ABCD9E
K1EM	38,786	376	82	S	ABCDE
K1FO	29,464	254	58	S	**D**
W3EP	21,460	290	74	S	**AB**
W1COT	18,980	247	52	S	ABCDE
N1NQD	11,568	193	48	S	ABCD
K1CPJ	10,980	174	45	S	ABCD9EF
AJ1X	6,230	178	35	S	A
W1QJL	6,105	116	37	S	ABCD
K1WVX	5,809	118	37	S	ABCDE
N1RXM	3,080	118	22	S	ABD
N8WXQ	2,472	103	24	S	AB
WA1GTP	2,442	72	33	S	ABC
W1NWE	2,358	102	18	S	BD
WB1GCM	1,824	76	24	S	AB
N1SAG	1,615	69	19	S	ABD
WB8IMY/1	646	31	19	S	ABD
W1TS	583	53	11	S	B
W1AW (NJ1Q,op)	473	43	11	S	AB
N1OPO	364	42	7	S	BD
N1BAH	306	51	6	S	AB
K1LXD	88	22	4	S	A
W1VT	25,168	230	52	Q	ABCD9EFGHI
N1QVQ	224	45	4	Q	BD
N1WES	208	22	8	Q	ABD
W1QK (+AA1MY,KD1XS,N1s ABY,GS,W1QJ, WW1O)	92,367	743	99	L	ABCD
N1WPB (+N1TDW)	6,396	206	26	L	ABCD
W1ORS (K1TMW,K2RPM,N1s KPR,OLX, PLP,N2BQA,W1ZQT,WA1EHK,ops)	2,418	80	26	L	ABCD

Eastern Massachusetts

WB1FKF	24,752	191	56	S	**ABCD9EFGHI**
KX1C	20,679	237	61	S	**ABCD9E**
WG1Z	11,340	190	45	S	ABCDE
WA1LBK	9,650	145	50	S	ABCDE
WA1ECF	9,457	150	49	S	ABCDE
K1GVM	6,650	134	38	S	ABCDE
WA1MTI	5,434	116	38	S	ABCDE
N1QPR	3,348	96	31	S	ABD
WC1B	3,150	101	30	S	ABD
WA1OFR	2,862	82	27	S	ABDEI
K1RV	1,704	71	24	S	AB
N1VQR	1,380	85	15	S	ABD
N1EKV	1,380	65	20	S	ABD
K1VZI	450	45	10	S	AB
WA1QWT	198	22	9	S	AB
W1DYJ	96	16	6	S	A
N1BWT (+KB1VC)	60,230	407	95	M	ABCD9EI
KA1EKR (+N1IA)	20,592	241	66	L	ABCD
N1JOY (+N1TZM)	7,800	176	40	L	ABD
K1EP (+KL7JT/1,W1SZ)	2,205	88	21	L	ABDE
N1FDX (+N1EDM)	1,125	75	15	L	AB

Maine

N1HOV	5,945	122	41	S	**ABD**
K1GAO	3,182	86	37	S	**A**
N1DGF	2,366	74	26	S	**BCD**
WA1JOF	714	33	21	S	ABD
W1QT	180	15	12	S	AB
K1WHS (+K1ART,WA1NIE)	153,672	681	152	M	ABCD9EF

New Hampshire

K1TR	128,440	662	130	S	**ABCD9EFGHI**
AF1T	82,320	434	120	S	ABCD9EFI
WA1YHO	40,053	258	79	S	**ABCD9EF**
AC1J	12,696	221	46	S	ABCD
KU2A	11,232	150	48	S	ABCD9E
N1JHJ	5,282	125	38	S	ABD
W1OA	1,475	54	25	S	ABCD
K1JY	494	31	13	S	BCD
W1QWJ	477	53	9	S	A
N1TZB	400	35	10	S	ABD
K1PDY	328	27	8	S	BCD
N1YHW	236	57	4	S	ABD
KC1HH	189	27	7	S	B
WA1YKM	162	18	9	S	AB
KB1QV	84	14	6	S	B
WB1FLD (+K1RDR,KA1FYB,KE1CS,N1NUM)	56,602	473	91	L	ABCD

Rhode Island

KM1X	23,256	312	72	S	**ABD**
W1LYT	6,435	158	39	S	ABCD
K1DS	522	51	9	S	ABC
AA1IW	490	35	14	S	A
K1MUJ (K1ZE,KA1ZNZ,ops)	38,847	367	69	L	BCDE
K1IKN (+K1MFA,N1s IIN,VDW,WA1ZPI)	9,102	215	37	L	ABDE

Vermont

W1AIM	35,298	257	111	S	**ABCD9E**
K1LPS	8,322	122	57	S	ABCD
N1UQT	8,151	122	57	S	**ABDE**
N1DIQ	1,288	46	28	S	AB
KA1CXD	884	52	17	S	B
N1XKH	544	54	8	S	BD

Western Massachusetts

N1DPM	153,440	509	140	S	**ABCD9EFG**
W1MBA	79,904	361	88	S	BD9EFGHI
N1LZC	43,560	410	72	S	ABCD9EF
N1MUW	37,960	399	73	S	ABCDE
N1MIA	14,628	273	53	S	ABD
K1ISW	12,825	211	45	S	ABCD
N1MHH	11,891	238	47	S	ABD
N1FUS	6,608	201	28	S	ABD
WA1UOL	3,870	111	30	S	ABCD
KD1XP	3,723	172	17	S	ABCD
NA1W	3,550	62	25	S	BCD9EFG
WA1ZUH	3,024	88	28	S	ABD
WA1NYV	2,235	149	15	S	B
KA1SUN	1,980	71	22	S	ABCDE
W1RIL	1,649	47	17	S	ABCD9EI
W1NMQ	1,020	60	17	S	AB
N1QKR	592	122	4	S	BD
N1RWC	273	35	7	S	ABCD
N1VMJ	64	32	2	S	B
N1JZO	63	21	3	S	AB
KB1AFZ	18	6	3	S	A
N1MUV	424	106	4	Q	AB
KR1R	4	2	2	Q	AB
NC1I (+AC1Y,NC1B,WF1R)	99,086	700	103	L	ABCD

2

Eastern New York

W2XL	46,956	406	91	S	**ABCD9**
WB2DUS	30,212	250	91	S	ABCDE
N2MCI	24,566	280	71	S	ABCD
KB2HQ	24,072	249	51	S	**ABCD9EFGHIJ**
W3HHN	22,968	259	66	S	ABCDE
K2ZZ	17,700	217	60	S	ABCD
WM2Y	12,204	260	36	S	ABCDE
WA2WQZ	11,528	262	44	S	**A**
N2YQW	9,676	193	41	S	**ABD**
KB2UZB	9,432	243	36	S	BCD
W2JHO	6,237	231	21	S	ABCD
WB2MRX	5,100	133	34	S	ABD
W2CCP	3,248	112	29	S	B
W2GKR	3,192	114	28	S	AB
N2NCQ	3,180	119	20	S	ABCD
N2YXW	3,066	124	21	S	ABD
KG2H	2,940	98	30	S	AB
W1XX	2,862	106	27	S	AB
WA1KKM	2,635	74	31	S	ABD
WA2BAH	2,210	142	13	S	ABCDE
N2TY	2,028	118	12	S	BDE
K2RI	1,668	93	12	S	BCD
N2UID	1,529	99	11	S	ABD
WB2YOR	1,524	100	12	S	ABD
WY2H	1,512	63	18	S	ABCD
WA2IWW	1,000	108	8	S	BD
N2YYU	960	71	10	S	BCD
AA2WQ	924	84	11	S	B
KA2MCU	900	76	10	S	ABCDE
KG2GX	837	66	9	S	BCD
KB2VQR	738	66	9	S	ABD
N2YXX	676	48	13	S	ABD
N2TMT	620	62	10	S	A
N2TTM	585	61	9	S	BD
W2RJS	576	36	16	S	B
AB2AF	484	40	11	S	BP
N2ZOE	460	115	4	S	B
N2TJQ	415	83	5	S	B
KB2WZT	310	38	5	S	BD
AA2CW	300	46	6	S	ABCD
KB2TPD	288	48	6	S	B
WB2BEJ	255	37	5	S	BCD
N2JJE	215	43	5	S	AB
WB2FWK	132	33	4	S	B
KB2WPA	132	31	4	S	BD
KB2VDR	124	31	4	S	B
K2UF	18	9	2	S	B
KB2VXF	350	70	5	Q	B
K2TVI (K2ZVI,N2s DHH,DVQ,FMC,GDY,HTT, GKM,NWZ,N3EMF,WA2LVY,WB2NHC,ops)	152,320	988	112	M	ABCD9EFIP
WA2AAU (+KC1ZN,N2YCA)	132,225	482	129	M	ABCD9EFGH
N2VOT (+KB2ZST,N2s WCY,YJZ,N3EYQ)	53,418	456	87	L	ABCD
N2SQW (+N2EUT)	11,316	198	46	L	ABCD

NYC–Long Island

N2LIV	42,822	378	78	S	**ABCD9E**
NB2T	10,360	255	28	S	BCD
WA2ZFH	10,080	207	36	S	ABCDE
N2QHS	2,928	97	24	S	ABD
N2DY	2,548	78	26	S	ABCD
N2HTU	1,302	76	14	S	BD
WB2AMU	663	39	17	S	AB
N2HCU	623	89	7	S	B
WV2C	328	41	8	S	B
KB2VKQ (KB2ULH,WB2SHZ,ops)	5,054	223	19	L	BD

Northern New Jersey

WB2VVV	80,010	505	105	S	**ABCD9E**
WB2WIH	43,014	467	67	S	ABCD
N2NF	12,480	265	40	S	ABCD
WB2QOQ	11,648	364	32	S	**B**
N2UAH	10,220	238	35	S	ABD
K2KIB	10,032	194	44	S	ABD
KB2IT	6,324	200	31	S	BD
WB2CUT	6,024	251	24	S	B
KC2CY	5,206	123	38	S	ABCD
NX2Q	3,294	183	18	S	B
N2NHN	2,880	96	30	S	**A**
WA2BKN (FN21)	2,544	99	24	S	ABD
N2LMU	2,244	152	12	S	BD
NW2L	1,118	78	13	S	ABCD
KB2TCF	1,100	100	11	S	B
K2JT	960	64	15	S	A
N3OIE	880	88	10	S	B
KC2HL	608	62	8	S	BD
WA2ASQ	374	34	11	S	A
AA2CN	360	36	10	S	A
WB2MBM	344	43	8	S	B
KA2NJP	224	56	4	S	B
W2JEK	172	43	4	S	A
N2ZBH	156	39	4	S	B
KB2VFT	104	26	4	S	A
KB2TAT	84	21	4	S	B
KB2SJG	45	15	3	S	B
NO2T (+KB2YGJ,N2S DSY,PBY,WA2s INW, QHL,WU2C)	88,827	814	87	L	ABCD

Northern New York

WA2AEY	14,283	207	69	S	**AB**
WB2KLD	5,382	105	46	S	**ABD**
KB2ZUP	2,422	167	14	S	BD
WB2BAU	8	4	2	S	B
N2ZLY	2	2	1	S	B
WN2R (+NET)	3,608	88	41	L	AB

Southern New Jersey

WC2K	276,937	853	163	S	**ABCD9EF**
AA2UK	231,972	658	156	S	ABCD9EFGHI
WB3JYO	149,940	674	105	S	ABCD9EFG
W2UR	140,448	545	112	S	ABCD9EFGH
N2SB	122,300	558	100	S	ABCD9EFGH
WB2YEH	72,261	493	63	S	ABCD9EFG
N2SJC	23,426	448	34	S	ABCDE
W2PAU	12,564	300	36	S	ABD
KD2KS	9,909	297	27	S	ABCD
N2OML	6,660	143	30	S	ABDE
WB2VLA	3,060	114	18	S	ABCD9
N2XYZ	2,907	146	19	S	BD
K2UT	1,512	153	7	S	BDE
K2ZA	1,309	77	17	S	AB
N2DEQ	1,220	112	10	S	BC
N2JVQ	858	63	13	S	ABD
W2ORA	728	66	8	S	ABCD
W2FGY	640	80	8	S	B
KA2YKN	623	81	7	S	BC
N2QWR	540	45	12	S	AB
N2EMR	456	57	8	S	AB
WA2YSW	390	61	5	S	BD
N2RUA	385	52	7	S	ABD
KA2KFO	287	41	7	S	B
WA2QZQ	216	49	4	S	BCD
KM2C	156	50	3	S	BD
K2VT	124	62	2	S	B
WA2DUE	120	21	4	S	BC
N2HQL	108	22	4	S	BC
WB2YZS	80	15	4	S	BD
N2VIZ	78	26	3	S	B
N2VPN	76	38	2	S	B
K2VS	70	35	2	S	B
WA2ABF	62	31	2	S	B
W2YRW	46	23	2	S	B
KB2BLO	34	16	2	S	BD
N2LGH	14	14	1	S	B
N2XQI	10	5	2	S	B
K2CR	5	5	1	S	B
W2KV (+N2s DK,NU)	24,722	526	47	L	B
K2AA (K2WB,KA2GSL,KF2YX,ops)	21,960	426	40	L	ABCD
W2MMD (KA2s EZN,FFS,KB2VXC,N2YIO,ops)	10,760	261	40	L	ABD

Western New York

W2FU	188,800	599	160	S	**ABCD9EFGHI**
WB2ELB	46,596	268	66	S	ABC9EFI**JP**
AA2WV	43,882	282	74	S	ABCD9EFGHIP
K2AN	43,758	363	66	S	ABCD9EF
N2ULL	35,700	298	68	S	ABCD9EF
K8ZES	35,055	321	95	S	ABD
N2DKP	30,744	305	72	S	ABCD9E
AA2GF	21,942	217	69	S	ABCDE
WA2BPE	20,475	208	75	S	ABCD
AA2GV	16,448	171	64	S	BCDE
W2FE	14,053	226	47	S	ABCD9E
AF2K	11,492	280	34	S	ABCD
KA2DQA	10,688	259	32	S	ABCD
WA2ZNC	10,062	203	39	S	ABCD
KA2ENE	9,180	269	27	S	ABD
N2HJD	8,760	245	24	S	ABCDEF
WY2Z	8,288	172	28	S	ABCDEIJP
N2MXG	7,888	170	29	S	ABCD9E
K2OEQ	6,390	161	30	S	ABD9
K2MPE	5,207	107	41	S	ABD
WB2VUO	5,016	174	22	S	ABCDE
WA2LSK	4,788	133	36	S	**A**
KE2T	4,761	153	23	S	ABCD
W2UAD	4,428	164	27	S	B
KB2NFS	4,125	189	15	S	BCD
KB2HVL	3,689	154	17	S	ABCD
WA2SCB	3,030	82	30	S	BD
KF2XC	2,682	107	18	S	ABCDE
W2WGL	2,640	72	30	S	BD
K2JD (AF2K,op)	2,603	103	19	S	ABCD
KB2WEU	2,600	191	10	S	BD
N2IJI	2,563	168	11	S	BCD
K2JIQ	2,050	82	25	S	B
KB2YWU	2,032	103	16	S	ABD
KC2AJX	1,970	145	10	S	BCD
WB2TPN	1,840	59	20	S	ABCDE
WW2J	1,820	146	10	S	BD
WB2JFL	1,800	90	20	S	AB
KB2ZZJ	1,344	55	21	S	ABD
N2USB	1,170	107	10	S	ABD
WD4SGU	952	100	8	S	BD
W9KXI	867	51	17	S	B
W2RW	840	79	8	S	BD
N2IXD	808	94	8	S	BD
NS9E	780	49	12	S	ABCD
KE2MK	570	95	6	S	B
N2VBK	560	40	14	S	AB
WY2Z (FN03)	390	9	6	S	BIJP
NQ2O	380	10	10	S	ABCD9EF
N2SNL	380	78	4	S	BD
KB2YVS	364	26	14	S	AB
WE2Y	352	16	11	S	D
N2ZXX	345	23	15	S	AB
KB2YTW (WB2VUO,op)	306	20	9	S	BCDE
KB2YVC	260	19	13	S	ABD
NA2X	230	46	5	S	B
KB2YMQ	176	22	8	S	A
AA2LQ	156	36	4	S	BD
AB2F	152	38	4	S	B
KB2YMO	150	50	3	S	B
K2ANC	132	33	4	S	B
WR2T	106	44	2	S	BD
KB2VGH(FN02)	102	6	6	S	BIJ
KB2VGH(FN03)	80	5	2	S	IJ
KB2VGH(FN12)	76	5	4	S	BIJ
KC2AJV	45	15	3	S	B
KC2AJS	42	21	2	S	B
KB2UW	36	12	3	S	B
N2HLT	32	2	2	S	IP
W3OAB	32	2	2	S	IP
KB2KJV	8	3	2	S	BC
KF2TV	5	5	1	S	B
N2UM	1,332	111	9	Q	BD
W2MI	156	24	6	Q	BCD
KA2WNS	112	26	4	Q	BCD
W2UTH (K2s DH,OS,KA2RDO,KD2KQ,N2WK, NJ2L,W2PJ,WA2MOP,ops)	495,288	1108	216	M	ABCD9EFGHIJP
N2ODK (+KD2YB,N2s HLT,JQR,W3OAB)	299,296	888	188	M	ABCD9EFGIP
WB2PSI (K2WN,KB2ZFE,KE2CP,N2WHT, W2RA,W0VU,WA2s IKC,KAE,WB2s, BYP,QCJ,ops)	102,032	531	112	M	ABCD9EFI
N2EZS (+KB2UW, KF2TV)	22,608	352	48	M	ABCD
N2XTX (+AK3R,KC2UA,N2s ODU,YCW,NY2Z, W2DRZ,WA3AWX)	180,495	825	189	L	ABCD
W2UB (+N2HXK,NZ2N)	5,265	117	39	L	ABD
KB2SGX (+KB2UVO)	4,270	114	35	L	ABD
WA2AAZ (KB2s YMO,YMQ,KC2s AJL,AJS,AJU, KG2JI,ops)	4,002	169	23	L	ABD
KB2VGH (+KB2WEV)	3417	193	13	L	ABD
KB2UDB (+KC2AJR)	2,886	180	13	L	ABD
W2OW (AA2s EQ,,MU,KB2YVS,KC2AIW,N3s VKM, YKF,WF2A,ops)	1,475	59	25	L	AB
KB2UJG (K2DN,KB2s FAF,LUV,KC2ACY, N2s MRE,ZPT,ops)	1,140	46	20	L	ABCD

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Delaware

W3OR	139,503	559	147	S	**ABCD9EFG**
KB3PD	3,059	82	23	S	BCD
N3XTK	1,540	77	20	S	B
KA3KHZ	407	37	11	S	B
WA3BZT	296	37	8	S	B
WA3U (+KB3PD)	38,056	393	67	M	ABCD9E

Eastern Pennsylvania

WA3AXV	262,080	814	140	S	**ABCD9EFGHI**
WA3NUF	177,862	707	113	S	ABCD9EFGHI
WB3KRW	127,765	641	115	S	ABCD9E
N3EXA	119,527	669	89	S	ABCD9EF
WA2FGK (K2LNS,op)	101,346	438	127	S	ABCD9EF
W3KM	88,116	497	84	S	ABCD9EFG
W2SK	74,316	493	66	S	ABCD9EFGHI
WA4GPM	58,344	393	104	S	ABCDE
K3GNC	53,130	407	69	S	ABCD9EF
N3FUJ	53,046	641	63	S	ABCD
N3NGE	51,821	335	77	S	ABCD9EF
N3ITT	47,275	465	61	S	ABCD9E
WB3FAA	40,803	322	87	S	ABCD9E
NK8Q	34,800	429	60	S	ABCDE
N3RN	32,040	305	89	S	ABCD9EF
AK3O	30,280	346	40	S	ABCD9EF
N3AOG	28,656	366	36	S	ABCD9EFG
W3GAD	26,884	422	47	S	ABCD
KB3ZS	25,145	356	47	S	ABCDE
K3IUV	24,581	345	47	S	ABCDE
N3JDQ	21,888	338	57	S	ABD
KB3IB	21,320	265	41	S	ABCD9E
K3MFI	21,216	421	34	S	ABCD9E
WA3EHD	20,424	359	37	S	ABCDE
WA3AQA	19,383	323	39	S	ABCDE
W3KKN	19,282	323	31	S	ABCD9EF
W3GXB	17,458	249	43	S	ABCD9E
WB8ZAR	15,600	232	40	S	ABC9EF
K3UZY	15,510	330	47	S	**B**
K3EBZ	12,342	268	33	S	ABCD
N3DQZ	12,104	229	34	S	ABCDE
KB3XG	11,880	147	22	S	ABCD9EFGHI
KB3HE	10,320	184	40	S	ABCD
KT2B	10,302	303	34	S	AB
W3IIT	10,208	246	32	S	ABCD
K3VGX	9,126	234	39	S	B
N3EMY	8,106	274	21	S	BCD
K3VB	7,810	273	22	S	ABCD
N3GSA	6,360	205	24	S	ABCD
AA3GN	6,264	116	29	S	ABD9
WA3RLT	6,129	156	27	S	ABDE
N3JNX	5,616	105	48	S	ABC
WA3IAC	5,525	186	17	S	ABCD9
KE3YQ	4,521	108	33	S	ABCD
KA2WRE	4,466	179	22	S	BD
K3ESJ	3,952	212	13	S	BCD
W3UQH	3,944	136	219	S	AB
W3HFY	3,900	110	20	S	ABCD9E
N3EMA	3,770	223	13	S	ABCD
N3TBB	3,243	141	23	S	AB
K3PHY	2,783	178	11	S	BC9
N3HBT	2,470	175	10	S	BCD
N3LMD	2,450	85	25	S	ABD
K3KEL	2,436	84	29	S	B
N3OZO	2,220	147	12	S	ABD
N3YOK	2,088	167	9	S	ABCD
KU3A	1,876	92	14	S	ABCD
N3VHU	1,512	134	8	S	BD

W3ICC 1,485 155 9 S BD
WA3CSP 1,440 60 24 S A
WA2GFP 928 80 8 S BCD
N3MAV 864 100 8 S ABC
KC2ZA 820 74 10 S BCD
N3BPJ 812 99 7 S BD
N3VRC 777 36 21 S ABD
W3AWA 777 100 7 S ABCD
N3LJC 655 115 5 S BD
WA3JMM 570 79 5 S ABC
N3RAH 540 93 5 S BD
W3JG 504 78 6 S ABD
N3LRJ 500 125 4 S B
W3JS 426 71 6 S B
N3HFV 403 31 13 S AB
N3NID 330 48 6 S ABCD
W3IAR 308 74 4 S BD
N3IPM 292 48 4 S BD
W3HMU 288 33 8 S AC
W3ALR 276 69 4 S B
KA3YCG 276 92 3 S B
N3HSV 240 49 4 S BD
KC3LE 216 27 8 S B
W3UQC 210 35 6 S B
W3DZH 200 19 10 S ABD
KA3MGB 188 47 4 S B
KD3DI 184 46 4 S B
K3BPP 160 28 4 S BC
N3SOQ 148 35 4 S BD
N3TLJ 140 20 7 S AB
N3MXT 130 65 2 S B
N3AHP 126 18 6 S ABCD
N3LJE 112 56 2 S B
N3VPG 110 55 2 S B
W3HK 80 11 5 S ABCD
KA3QBB 66 33 2 S B
N3RAG 52 26 2 S B
WA3CQT 42 11 3 S ABC
WG3S 33 33 1 S B
WB3BNE 28 6 4 S BD
N3RAL 24 8 3 S B
W3TDZ 10 5 2 S B
N3RIA 3 3 1 S B
N3YNX 3 3 1 S B
WB3ABH 232 58 4 Q B
K3QQ 48 10 4 Q ABD
W8IJ 4 2 2 Q AB
K3MQH (K3s IXD,JFL,MM,RA,N3s EYB,KTV, W2EOS,W3GHR,WF3T,ops)
653,034 1890 254 M ABCD9E
W0RSJ (+KD2IX,WB2ONA)
115,884 736 111 M ABCD9EFG
WA2OMY (+WA3YUE)
108,290 632 98 M ABCD9EFGHP
K3EOD (N3DG, WA3IAC, WR3P, WF3W,ops)
89,320 841 77 M ABCD9E
N3ADC (+N3S NFB,RSE)
32,076 347 54 M ABCD9E
K3DMA (+NET)
12,475 305 25 M ABCDE
W3RT (+N3HTZ)
11,704 222 38 M ABCDE
W3HZU (N3s NBT,RBT,WB3CQN)
4,800 125 32 M ABCDE
K3CT (+KB3s BPQ,BPR,N3RXJ)
36,946 457 58 L BCD
N3ORF (+N3FJA)
4,984 148 28 L ABD
W3AD (N3s PTT,TJJ,TPL,TUQ,UED,ops)
3,780 140 27 L AB
W3ZGD (KA3LJL,N3s UOO,VQH,VQI,ops)
1,425 90 15 L BD

Maryland-DC

K1RZ 188,649 777 153 S **ABCD9EF**
WB2DNE 101,475 522 123 S ABCD9E
KH2CY 21,952 246 64 S ABDE
K3ZO 8,621 233 37 S AB
N3HBX 7,380 157 41 S ABD
W3MR 3,480 110 30 S ABD
KA3TCC 3,312 116 24 S ABD
W3GN 1,320 55 24 S AB
WB2BZR 1,260 53 14 S ABCDE
N3BWJ 819 62 13 S ABD
N3UMA 704 64 11 S B
N3XFO 520 39 13 S ABD
NR4M 456 60 6 S BD
N3WKE 384 64 6 S B
W3LMC 175 25 7 S B
N3WGC 148 36 4 S BD
N3XFM 112 28 4 S AB
K3UAL 112 28 4 S AB
W8TL/3 49,818 267 114 Q ABCD9E
W3IP (+K3HH,N3s CBJ,FNE,WB6VGI,WG3R)
118,708 602 118 M ABCD9EFI
N3XLW (+W3CQH)
3,171 137 21 L ABD
KB8VLI (+KB9PIV)
1,710 85 18 L ABD

Western Pennsylvania

NO3I 34,476 248 102 S **ABDE**
AA3GM 11,907 140 63 S **ABCDE**
KA3SDP 11,446 148 59 S ABD
N3PUR 5,698 154 37 S **A**
W3BBO 4,680 102 39 S ABD
N3YBE 4,142 99 38 S ABCD
K3TLP 2,016 63 32 S AB
W3OOM 544 34 16 S A
W3KJM 378 27 14 S A
W3HDH 180 15 12 S A
W3ZA 153 17 9 S AB
KA3JWJ 121 11 11 S A
KA3AVB 108 18 6 S AB
NB4J 66 11 6 S B
N3WAV 40 8 5 S AB
WB8EIY 35 7 5 S A
N3KJB 24 6 4 S A
K3MJW (KA3s JWJ,WSW,N3WAV,ops)
2,128 70 28 L ABD

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Alabama

KE4HJQ 5,160 101 43 S **ABCD**
KD4FMN 738 36 18 S ABD
KF4KVH (AB4UP,KD4MQA,N4GKE,WA4III,ops)
6,580 127 47 L ABCD

Georgia

KD4HLG 12,636 191 54 S **ABCD**
WA4KXY 10,808 185 56 S **ABD**
WA4OYH 2,700 75 27 S ABCD
K4KAZ 2,139 69 23 S ABCDE
WD4MBK 1,700 45 20 S **BCD**E
KF4DZV 784 55 14 S ABD
KF4KUO 33 11 3 S B
KE4QLH 36 12 3 Q B
W4PYM (AE4GQ,K4SZ,KC4GCK,KE4NYK, KF4KAN,KT4XE,W4FLY,ops)
816 41 16 L ABCD

Kentucky

K4TO 40,119 230 129 S **ABCD**
WA4FVQ 12,648 125 62 S ABCD**9E**
KE4JFS 6,936 130 51 S ABD
KE4PZT 12 4 3 Q A

North Carolina

K4QI 48,120 229 120 S **BDE**
AA4ZZ 11,904 183 62 S **ABC**
W4VHH 8,060 82 52 S BDE**FGI**
N4PPH 1,170 45 26 S B
AA4NC 220 20 11 S AB
NG4C (+N4ZWQ)
18,630 194 81 L ABCD
KE4HYM (+KE4GCF)
828 39 18 L ABCD

Northern Florida

KA4VXT 7,695 118 45 S **ABDE**
K4RZB 7,515 115 45 S **ABCDE**
KT4AL 5,822 99 41 S ABDE
KE4YYD 3,003 78 33 S ABD
KQ4PI 2,436 53 29 S ABCDE
KE4LVQ (+KB9KOH,KF4KWN)
627 33 19 L AB

South Carolina

AC4Q 1,058 36 23 S **ABCD**
KE4YCI 51 16 3 S BD
N4UK (+W3ZZ,W4XP,WD8ISK)
149,112 513 228 L ABCD
KD4ZMR (+KA4ABW,KD4s TCA,TCB,KE4JNY)
5,822 125 41 L ABD

Southern Florida

K4NB 2,783 104 23 S ABD
K2OY 2,552 108 22 S **ABD**
N5PIP 2,499 115 17 S **BD**
KA1ZFO 1,309 56 17 S BD
K9HUY 1,178 59 19 S ABD
KD4JMV 902 74 11 S BD
KD4NUA 68 34 2 S B
KD4ZKX 16 16 1 S B
KM4XN 14 7 2 S B

Tennessee

KC4QWZ 49,569 288 123 S **ABCDE**
WB4JGG 22,160 211 80 S ABCD
NS4W 21,093 178 89 S ABCD
WB4ZUG 7,150 114 55 S ABD
KD4HIK 6,342 128 42 S ABD
KE4JLE 5,198 113 46 S AB
AD4F 2,528 72 32 S ABD
N4LGY 1,100 45 20 S BCD
KD4NOQ 1,080 41 18 S BCD

Virginia

K9OYD/4 54,800 334 100 S **ABCD9E**
N4KWX 38,367 302 87 S ABCDE
KD4UPF 25,988 262 73 S ABCD
AD4DG 11,773 143 61 S ABCDE
K4FTO 10,164 188 42 S ABCD
N4BG 1,768 63 26 S ABD
AD4TJ 1,178 62 19 S AB
KF4NSH 1,161 41 27 S ABD
W4LTU 1,026 57 18 S A
N4MM 814 14 6 S A
K4ME 560 40 14 S B
WB3AKD 549 61 9 S B
AD4NJ 390 25 13 S ABCD
W4KK 60 15 4 S B
WD4GSM (KC4ATS,KE4SCJ,KF4NSH, N4FPR,ops)
4,532 75 44 L ABCD

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Arkansas

KAØNNO (+NØEOQ)
4,131 75 51 L ABCD

Louisiana

N5MYH 1,943 59 29 S **ABD**
W5FYZ 646 38 17 S B
N5VVB (+N5UXT)
496 27 16 L ABD

New Mexico

K5RHR 8,712 140 44 S **ABCD**
N5XZM (DM65)
2,288 65 26 S ABCDE
N9KUW 2,162 76 23 S ABD
W5DO 1,298 49 22 S ABD
KB5ZSK 780 42 13 S ABCD
W5FF 325 25 13 S **A**
WA5DJJ 234 21 9 S ABCD

North Texas

KY5N 4,992 128 39 S **AB**
KK6IT 4,256 152 28 S **B**
KD4HUR 3,729 93 33 S **ABD**
KK5DY 2,996 107 28 S B
KC5VQD 1,540 30 22 S ABCD**9EI**
KB5OAI 1,026 49 19 S ABCD
KB5UBE (+WA5VJB)
15,280 205 40 M ABCD9EHIJP
WA5VKS (+KC5LBE)
7,689 184 33 L ABCD
KA5BOU (+N5RDB)
6,601 110 41 L ABDE
KC5ONJ (+KA5VAN,KC5s MGL,QKZ)
2,619 87 27 L ABD

Oklahoma

W0RRY 12,998 157 67 S **ABDE**
N5TML 3,861 77 39 S ABD
KB5YAJ 1,534 58 26 S ABD
KC5UZY 777 37 21 S AB
KC5UGY 221 17 13 S AB
KAØBEI 105 15 7 S B
WD5AGO (+KC5RBH)
13,035 111 55 L BDEP

South Texas

N5WS 26,296 229 76 S **ABCD9E**
W3XO/5 7,392 126 44 S ABCD9E
W5UWB 4,329 99 37 S ABCD
W5EHM 2,522 97 26 S AB
KK5OA 1,092 52 21 S AB
KC5CXU 217 31 7 S B
KK5DK 4 2 2 S B
KB5IUA (+WX5DX)
26,925 261 75 M ABCD9E

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East Bay

WB5OMF 29,696 284 64 S **ABCDE**
W7KK 1,080 61 15 S BCD
WB6ETY 336 38 7 S BC

Los Angeles

W3SE 18,330 330 39 S **ABCD**
AC6TA 7,784 215 28 S **ABD**
W6IST 3,990 139 21 S ABCD
KE6MAS 3,672 140 18 S ABCD**E**
KD6CML 3,360 116 20 S ABCD
KE6FCT 3,278 119 22 S ABCD
KE6AXJ 2,730 121 14 S BCD
KE6MAK 1,416 88 12 S ABD
WA9STI 1,212 79 12 S ABD
KE6FVN 1,148 54 14 S ABCD
W6GGV 918 35 17 S ABCD
N6WZI 492 82 6 S B
N6OPR 329 47 7 S B
KF6EOJ 110 18 5 S BD
K6FP 84 21 4 S AB
KD6UNR 39 13 3 S B
N8KH 7,130 230 23 Q ABCD
W6TRW (KB6TVJ,KD6WYQ,KE6s MJU,SNF, KF6EXC,KQ6CG,KS4IS,N6s CIZ,ZAY, WA6MPF,ops)
4,906 169 22 M ABCDE
N6RMJ (+K6KWQ,WA6DJS,WB2ODH)
60,512 351 122 L ABCD
W6TOI (KB6WKT,KE6HPZ,WB6JDH,ops)
12,800 291 32 L ABCD

Orange

KE6WWL 6,520 133 20 S **DE**
KG6EG 6,237 150 33 S **ABD**
K7JA 5,112 142 18 S **D**
KE6GFF 4,032 126 16 S D
K6IBY 4,026 80 33 S **ABCD**
KE6CHC 2,004 114 12 S BCD
K6TSK 1,800 65 18 S BD
KD6UIH 1,387 43 19 S ACD
KE6QCB 329 38 7 S BD
W6FC 276 19 12 S ABD
W6ZN 3,553 136 17 Q BCDE
KE6GFI 2,010 131 10 Q BD
KE6WOX 160 40 4 Q B
KI6FF (+KD6MWZ)
8,649 222 31 L BD

Santa Barbara

N6QOA 3,375 89 27 S **ABCD**
K6VMN 1,245 83 15 S **B**
KE6FKA 1,024 59 16 S **ABCD**
KD6TBE 966 62 14 S ABCD
W6BKY 30 10 3 S B
NS6X 37,920 84 80 Q ABCD9EFGHIJKLNOP
KØBGL (+KD6s BZN,UUN)
8,028 181 36 M ABCDE

Santa Clara Valley

W6IT 5,536 122 32 S ABCDE
AB6SO 2,625 76 21 S **ABCDE**
N6JET 2,436 88 21 S ABD
K6RFM 2,295 94 17 S ABCDE
WB6LRV 1,413 134 9 S **BD**
WA6UAP 1,166 53 11 S **D**
W7KKE 930 64 10 S ABD
W6ISO 708 59 12 S B
N6NZ 672 36 12 S **BDE**
KN6PE 488 44 8 S BD
KA6SIQ 15 4 3 S BD
KD6PIW 200 25 8 Q AB
WA6RNC (+WB6W)
1,056 86 12 L BC

San Diego

KE6NRO 3,336 111 24 S **ABD**
KD6EFQ 2,520 103 15 S ABCD
W6OYJ 2,128 75 19 S **BCD**I
K6IAH 126 21 6 S AB
KE6SDQ 114 18 6 S BD
KD6DHB (+KC6s LVG,TMB,KE6VAW)
198 14 11 L ABCD

San Francisco

KE6UWK 318 53 6 Q B
WA6KLK (+WD6HDY)
14,147 244 47 L ABDE

San Joaquin Valley

N6AJ 15,792 190 56 S **ABDE**
N7STU 12,188 175 44 S **BDE**
K6ALE 9,652 199 38 S ABCD
WJ6T 7,839 150 39 S ABD
K6YK 5,670 173 27 S **BCD**
W6KOC 5,508 98 36 S ABDE
N6IFW 3,168 132 24 S AB
KD6RRV 259 37 7 S B
KF6CNV 216 36 6 S B
KG6AO 24 6 4 S B
KK6KE 17,874 215 54 Q ABCDE
KC6UCN (+KB6HRB,KE6IPA,KF6s DDT,DST)
19,140 282 44 M ABCDE
WA6YDI (+K6MI,KC6QPO)
18,444 225 53 M ABCDE

Sacramento Valley

N6KBX 16,170 230 55 S **ABD**
KC6ZWT 15,680 253 40 S **BCD**
KA6VQV 12,048 186 48 S ABCD
WA5YWC 7,848 172 36 S ABD
KE6DPV 5,518 136 31 S **ABDE**
KF6FEE 4,930 137 29 S ABCDE
KD6VNQ 4,116 128 28 S BC
K6FO 2,508 120 19 S ABD
W6JEX 1,105 56 17 S BCD
KE6NTZ 376 39 8 S BD
K6PU 16 4 2 S D

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Arizona

KB7VCO 2,950 94 25 S **ABD**
N7GJD 550 38 11 S ABD
WB7OHF 243 25 9 S ABD
W9SE 1 1 1 S A
KC7CAL 1,050 110 7 Q BD
N7SQN (+KC7KMJ)
1,242 51 18 L ABDE
N7TX (+KC7OMT,KR4EN)
660 48 11 L ABD

Eastern Washington

N7AU 4,674 89 41 S **ABCDE**
N3CEV 1,708 47 28 S ABD**9E**
AB7IZ 140 19 7 S ABD
KB7UWC (+W7FHI)
5,418 98 42 M ABCD9E

Idaho

KJ7TH 1,694 92 14 S **ABD**
KA7GUX 1,222 41 26 S **ABD**
KK7AT 395 56 5 S BD
KK7CV 189 44 3 S BD
KJ7TI 86 31 2 S BD
KC7SBI 80 31 2 S BD
KC7SBH 76 30 2 S BD

Nevada

K7ICW 5,828 95 47 S **ABC**DE
KF7UV 4,641 89 39 S **ABCD**
WB7TDI 799 41 17 S ABD
NW7O 24 3 2 S **E**
W7PW 387 43 9 Q B

Oregon

N7EIJ 3,875 114 31 S ABD
N7YAG 3,654 99 29 S **ABCDE**
N7DB 2,112 82 24 S **ABCD**
K7ZL 663 39 17 S AB
K7HSJ 660 35 15 S ABCDE
KA7MFM 364 26 14 S B
KI7N 9 9 1 S B
WA7IQH (+KD6VLR,W7IK)
2,660 87 28 L ABCD

Utah

NT7A 2,475 73 25 S **ABDE**
K7DJB 1,740 61 20 S ABDE
N7MLD 1,122 55 17 S ABD
KA9LNP 765 44 15 S ABD
KC7KDZ 259 32 7 S BD
KC7QFS 85 17 5 S B
KC7KZD 40 10 4 S B

Western Washington

KE7WS 14,382 208 47 S **ABCD9E**
WA7UQV 6,534 173 33 S **ABCDE**
K7XD 3,968 114 31 S ABD
AA7VT 2,037 67 21 S ABCD9E
W3JPT 336 36 8 S ABD

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Michigan

KU8Y 111,706 536 158 S **ABCD9E**
WZ8T 65,780 389 130 S **ABCDE**
K8MD 63,784 326 134 S ABCD9E
K2YAZ 54,864 305 127 S ABCD9E
W8KX 30,870 242 98 S ABCD
K8RS 24,150 258 75 S ABCDE
K8NNU 21,797 242 71 S ABCD
KG8XM 20,088 249 72 S ABCD
K8KD 16,835 259 65 S AB
NQ8A 16,650 141 75 S ABCD9E
N8NQS 10,788 174 62 S AB
WB8TGY 8,162 90 53 S ABD9EF
K8NFT 6,900 128 50 S ABCD
WD8BKM 5,289 83 41 S BDE
N8CGY 5,175 103 45 S ABD
K8ET 4,720 106 40 S ABD
W8WNX 3,570 105 34 S A
N8PJP 2,813 73 29 S ABCD
NE8I 2,538 54 27 S ABCDEF
N8BNE 1,782 66 27 S A
KG8ZF 1,426 51 23 S BD
N8XKZ 1,239 59 21 S B
W8SGR 792 43 18 S ABD
KB8MBC 704 32 22 S A
N8ZVB 481 37 13 S AB
KC8DPT 24 8 3 S AB
K8EB (+KF8QL,KG8PZ)
17,226 229 66 L ABD
WA8RLI (+KA8UHG,KB8ZAU,KE4JDW,N8OEO)
8,240 171 40 L ABCD
N8CTJ (+KC8s AQH,CJZ,WJ8X)
4,192 131 32 L AB
KC8ALA (+N8PVT)
88 11 8 L B

Ohio

WA8WZG 467,712 754 256 S ABC**D9EFGHI**
KE8FD 167,800 529 200 S ABCD9E
WA8NJR 161,980 591 178 S ABCD9EF
KB8ZW 56,394 350 117 S ABCDE
K8TQK 36,059 212 107 S BCDE
K8MR 35,816 316 88 S ABCD
WA8TJL 33,904 220 104 S ABCD9E
N8ZJN 24,444 197 84 S ABCDE
KE8RO 22,550 227 82 S ABD
KC8CSD 19,824 190 84 S ABD
WD8AML 9,699 134 53 S ABD
WD8BHO 9,381 129 53 S BD
WB8AUK 7,600 118 50 S ABD
KG8XU 6,683 134 41 S ABCD
WA8RJF 6,426 100 51 S ABD9E
W8BAE (WA8SMO,op)
5,805 124 43 S ABC
KB8YKR 5,043 100 41 S ABD
KB8VUJ 4,000 80 40 S ABD
W8OUD 3,959 83 37 S BD
W1FEZ 3,672 88 36 S BD
WA8RCN 3,192 114 28 S AB
N8QQB 3,131 87 31 S ABD
KB8UUZ 2,890 85 34 S AB
WA8GMT 2,850 95 30 S A
WA8TWM 2,754 68 34 S ABD
N8SSH 2,600 100 26 S B
N8CCC 2,555 65 35 S ABCD
KB8STK 2,511 71 27 S BD
KF8VB 2,496 81 26 S ABD

K8AB	2,346	101	23	S	BD
N8IBW	2,106	64	27	S	ABD
N8PTL	1,452	52	22	S	ABD
KB8WZZ	1,232	67	16	S	ABD
W8ILC	1,200	58	20	S	ABD
KT8U	1,071	51	21	S	AB
KG8TL	897	58	13	S	ABD
N8PZD	715	55	13	S	AB
KB1SF/8	480	26	16	S	BD
N8QXC	468	34	13	S	ABD
N8VEA	372	29	12	S	BD
KB8RXY	132	32	3	S	BD
WA8SMH	105	25	3	S	BC
N8TQT	96	32	3	S	AB
KB8WCV	81	24	3	S	BD
KC8AGH	78	26	3	S	AB
KC8BDY	74	26	2	S	BD
N8LIS	66	27	2	S	BD
KB8TDC	57	13	3	S	BCD
N8QWJ	50	18	2	S	BD
N8QQA	48	17	2	S	BD
KA8RIQ	34	12	2	S	BD
KF8EF	24	9	2	S	BD
W8IDM	10	10	1	S	B
KC8BUN	15,879	183	67	Q	ABCD
N8XA	5,781	97	41	Q	ABCD9E
W8ULC (+W8LR,WF8Z)					
	159,344	610	184	M	ABCD9E
WA8BCA (K8s DIO,III,WW,ops)					
	34,207	433	79	L	A
KB8UHY (+KB8SRQ,N8SPW)					
	4,773	113	37	L	ABD
K8KRG (KB8s AOX,VKF,N8PZD,ops)					
	819	63	13	L	AB

West Virginia

K2UOP/8	81,270	349	129	S	**ABCD9E**
N8XUR	14,760	176	60	S	ABCDE
W8ZP	11,682	136	66	S	ABCD
WA3HQK	1,539	57	27	S	B
N3IWJ	735	35	21	S	AB
WB8BEL	540	27	20	S	A
WA8WV	459	27	17	S	B
K8JF (K8LG,WA8YCG,WD8AFJ,WF8X,ops)					
	585	39	15	L	B

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Illinois

N2BJ	149,641	700	151	S	**ABCD9E**
K9ZZE	14,664	250	52	S	ABD
K9PW	14,573	247	59	S	**A**
N9WRO	12,105	191	45	S	ABCD9E
W9IIX	11,662	228	49	S	ABD
WA9FIH (EN61)					
	10,824	262	33	S	ABCD
W9JGV	8,365	239	35	S	B
WA9CCQ	8,268	262	26	S	ABCD
WB9SNR	8,064	87	48	S	ABCD9EF
N9CXO	7,289	160	37	S	ABD
WD9ISG	5,124	146	28	S	BD
WB9VTF	3,796	146	26	S	B
WB9IFM	3,591	133	27	S	AB
KB9LDG	3,519	152	23	S	ABD
N9WJI	3,507	134	21	S	ABCD
W9AVB	3,400	136	20	S	ABCD
WA9CJZ	3,312	176	16	S	ABD
WA9RIJ	2,916	202	12	S	ABD
W9NHX	2,282	146	14	S	ABD
N9TUQ	2,002	132	13	S	ABD
W9CEJ	1,680	140	12	S	B
KB9KDC	1,680	140	12	S	B
N9TUP	1,482	101	13	S	ABD
N9SXG	1,152	113	8	S	BD
WN9GUC	1,148	70	14	S	ABD
KW9KW	1,140	38	30	S	AB
KV9Y	988	66	13	S	BD
WB9WFR	938	67	14	S	AB
N9YZK (EN61)	870	124	6	S	BD
W9NSP	854	100	7	S	BCD
K9ZWU	819	78	9	S	ABD
K9VGN	737	59	11	S	ABCD
K9ZWV	720	77	8	S	ABD
AK9Y	636	159	4	S	B
N9OBE	544	32	17	S	A
KG9H	430	38	10	S	ABD
W9ZZU	404	101	4	S	B
K9LPL	404	101	4	S	B
KA9VOX	360	60	6	S	B
K9DQU	352	41	8	S	ABD
WD9GJK	336	43	7	S	ABC
K9TMW (EN61)					
	316	79	4	S	B
N9VLL	308	77	4	S	B
K9USW	268	67	4	S	B
W9LAU	240	37	6	S	BD
KF9JC	228	57	4	S	B
WA9GQK	212	53	4	S	B
K9IOG	212	53	4	S	B
WA9RSH	210	40	5	S	BD
KB9MLA	160	40	4	S	B
W9VA	153	17	9	S	A
KC9NF	81	27	3	S	B
K9DKI	66	33	2	S	B
KA9UZH	58	29	2	S	B
N9ZKC	44	22	2	S	B
W9REC	40	20	2	S	B
W9DY	3	3	1	S	B
N9TZL	3,683	114	29	Q	BD
N9KXE	148	33	4	Q	BD
WD9EXD (+W9RVG)					
	30,240	226	112	L	ABCD
WD8KHE (+N9QDK)					
	9,408	144	49	L	ABCD

Indiana

K9MRI	103,842	471	162	S	**ABCD9E**
W9SO	51,304	344	121	S	**ABCD**
KA9QFL	30,212	302	83	S	ABCD
KB9IEC	25,010	247	82	S	BD
K9EA	12,338	145	62	S	BCD
W9DZ	10,974	153	59	S	ABD
KB9FZQ	9,982	115	62	S	ABCD
N9RZY	8,046	149	54	S	AB
N8LUX	7,824	163	48	S	AB
WB9DRB	6,313	81	59	S	ABCDE
WB8YFE	3,840	65	48	S	ABCD
WA1MKE	2,106	64	26	S	ABD
N9EYO	2,054	79	26	S	B
KC9RT	1,740	58	30	S	B
KB9NKM	1,449	63	23	S	B
W9ESU	1,064	51	19	S	ABD
KB9JKS	994	122	7	S	BCD
KD6RXT	616	50	11	S	ABD
W9PMJ	324	81	4	S	B
K9RU	12,096	165	63	L	ABD
WD9DSN (+WD9DSP)					
	3,379	109	31	L	AB

Wisconsin

W0UC/9	96,726	486	147	S	**ABCD9EFGI**
AA9AO	81,357	437	141	S	**ABCDE**
WF9X	33,370	250	94	S	ABCDE
K9BZ	25,860	368	60	S	ABD
KA9HKL	15,048	179	72	S	ABD
WA9LWJ	14,700	153	75	S	ABCD
N9YKE	13,365	170	55	S	ABCDE
N9LMU	11,656	163	62	S	ABCD
WA9PWP	9,000	180	50	S	AB
WD9BGA	7,738	114	53	S	ABD
N9JR	7,285	122	47	S	ABCD
N9QZD	6,532	84	46	S	ABDE
W9PHJ	5,628	121	42	S	ABD
N9UUR	5,460	94	39	S	ABCDE
N0AKC	5,207	103	41	S	ABCD
KF9YR	4,428	108	41	S	AB
N9ISN	4,181	107	37	S	ABD
WA9LZM	3,234	88	33	S	ABD
N9WHR	3,190	110	29	S	AB
WA9O	2,924	57	34	S	ABD9E
N9TD	2,574	63	33	S	BD
N9NGH	2,464	119	14	S	BCD
KA9JCP	2,280	75	24	S	ABCD
WA9HCZ	2,204	62	29	S	ABD
WB9VYP	2,002	67	26	S	BD
WA1UJU/9	1,936	88	22	S	B
N9UBS	1,711	58	29	S	ABD
K9OSH	1,656	62	24	S	ABD
WA9KVS	1,593	57	27	S	ABD
N9CIQ	1,485	43	27	S	ABD
ND9Z	1,485	45	27	S	ABD
KD9PW	1,428	51	28	S	AB
N9DDH	1,350	54	25	S	AB
WW1M	1,340	53	20	S	ABCD
WB9YZU	1,220	61	20	S	AB
N9ROX	1,150	41	25	S	ABD
KB9JIF	1,120	56	20	S	AB
KF9VV	840	45	15	S	ABD
N9OO	825	55	15	S	B
N9XRO	770	47	14	S	ABD
W9KHH	495	33	15	S	B
N9PBA	492	40	12	S	ABC
W9NVK	451	41	11	S	B
N9NOF	350	27	10	S	ABD
N9NDP	256	30	8	S	BC
N9UDX	198	19	9	S	BD
K9VGE	88	11	8	S	B
NI9E (+WB9UAI)					
	27,594	323	73	L	ABCD
N9WBR (+N9WVD)					
	5,625	125	45	L	AB
WA9SZH (+N9XIX)					
	504	28	18	L	AB

Ø

Colorado

N0EC	34,680	243	85	S	**ABCD9EFI**
K0GU	17,325	208	75	S	**ABCD**
K0RZ	14,168	109	56	S	**BCD9EFI**
N0IVN	11,357	180	41	S	ABCD9EI
W0ETT	1,748	58	23	S	ABDE
KB0TKR	1,449	58	23	S	ABD
KB0SZG	684	51	12	S	ABD
AC6IO (+K0UK,KE6LHL,ops)					
	1,554	55	21	M	ABCDE
W0TM (+W0KEA)					
	912	38	19	L	ABCD

Iowa

K0KD	18,690	154	89	S	**ABCDE**
W0YPT	1,917	50	27	S	BCD
N0SPP	888	37	24	S	AB
KB0OCM/N	84	12	7	S	AB
KD0BT	70	8	7	S	ABD

Kansas

WQ0P	32,476	208	92	S	**ABCD9EHI**
N0LL	29,298	214	114	S	**ABCDE**
N0FFO	9,204	104	52	S	ABDE
W0RT	4,905	91	45	S	ABD
N0LIE	2,697	87	31	S	B
W0QNX	455	50	7	S	BD
KB0QMF	420	30	14	S	B
KA0KAN	72	12	6	Q	AB
KF0M (+N0ZHA)					
	9,296	122	56	L	BCD
KG0WA (+KB0s MNZ,YHU,YWM,N5CLU)					
	9,288	113	54	L	ABDE

Minnesota

N0HJZ	92,456	450	127	S	**ABCD9EFGI**
WA0BWE	50,688	360	88	S	ABCD9EFGH
KB0IKP	33,200	298	83	S	ABCDE
W0ZQ	22,597	222	59	S	ABCD9EI
KA0RYT	16,335	203	55	S	ABDE
K0GJX	13,622	190	49	S	ABCDE
WA2HFI/Ø	9,583	165	37	S	ABCD9E
WB0LJC	9,440	211	32	S	ABD9E
W0AUS	8,033	181	29	S	ABCDEIJ
KB0PYO	7,800	135	52	S	ABCE
W0OHU (EN34)					
	7,683	148	39	S	BD
K0JO	7,344	145	34	S	ABCD9E
KB0VUK	6,300	198	30	S	ABD
NC9F	6,270	200	22	S	ABCD
KA0ZYD	6,105	123	37	S	BD
KG0BG	5,700	150	30	S	ABD
N0TMQ	4,525	165	25	S	ABD
KB0IXC	3,800	143	25	S	ABD
W0EPZ	3,740	139	22	S	ABD
AJ0K	3,211	125	19	S	ABCD
N0UK	3,094	116	17	S	ABDE
WA2VOI	2,958	113	17	S	ABCDE
W0LCP	2,546	114	19	S	ABD
N0OYQ	2,440	94	20	S	ABCD
KA0PQW	2,415	91	23	S	ABCD
KA0NAN	2,272	101	16	S	ABCD
W9IVI	2,176	111	16	S	ABD
WG0D	2,080	73	16	S	B9E
WS0H	1,845	71	15	S	ABCD9E
KB0TZA	1,670	133	10	S	ABD
KB0PUW	1,666	119	14	S	B
N0CKK	1,364	41	22	S	ABCDE
KG0ZQ	1,358	92	14	S	ABC
KB0OBT	1,332	97	12	S	ABD
N0ZIW	1,330	99	10	S	ABCD
KB0WUK	1,224	142	8	S	BD
KB0NMN	1,164	79	12	S	BCD
W0PHD	1,104	32	23	S	ABDE
N0QHP	1,100	80	10	S	ABCD
WB0SOK	1,070	89	10	S	BD
N0VUQ	1,036	74	14	S	B
N0SUO	1,010	76	10	S	ABD
W0LER	936	56	12	S	BD
N0NAS	910	75	10	S	ABD
W0OHU	832	50	13	S	BD
N0ON	759	62	11	S	BD
W0IBM	748	53	11	S	BD
KE4KE	744	58	12	S	BCD
N0VUR	696	58	12	S	B
N0MTR	672	71	7	S	ABD
WB0TDN	657	61	9	S	BCD
WA0RSE	657	44	9	S	BDIJ
N0UHV	640	47	10	S	ABD
AA0SM	539	67	7	S	BD
KB0TEH (EN34)					
	440	37	10	S	ABD
N0PDD	392	45	7	S	BD
WA0RLY	385	30	11	S	ABCD
K0EN	384	51	6	S	BD
KG0ZT	378	48	7	S	BD
W0KRX	357	13	7	S	BCDEFGH
WD0HHH	294	49	6	S	B
KB0OFF	245	49	5	S	B
N0MGY	225	36	5	S	BD
KB0RZZ	222	37	6	S	B
WB0GGM	189	8	7	S	ABCDEFI
KG0CV	182	17	7	S	BCD
KB0UCP	170	34	5	S	B
N0ADQ (EN33)	148	37	4	S	B
WB0FWI	144	24	6	S	AB
KB0OIS	140	35	4	S	B
KB0YAE (EN33)	84	20	4	S	BD
K0KTY	76	19	4	S	B
KB0TEJ	46	23	2	S	B
N0ADQ	40	20	2	S	B
WB0LSG	38	19	2	S	B
N0PGQ	36	18	2	S	B
N0CET	33	11	3	S	B
K0PSH	33	11	3	S	B
KG0KJ	16	8	2	S	B
W0PLD	12	12	1	S	B
KB0RZW	12	12	1	S	B
N0HZO	12	4	3	S	B
KB0MRK	9	3	3	S	B
KB0UWW	6	2	2	S	BD
KB0WDI	6	3	2	S	B
KE4KE (EN33)	4	2	2	S	B
KB0OND	4	2	1	S	D
KC4AVR (EN33)	4	2	2	S	B
KC4AVR	3	3	1	S	B
N0ZSY	1	1	1	S	B
KB0WDM	1	1	1	S	B
N0HZN	1	1	1	S	B
N0WCB	588	60	7	Q	BCD
KB0YAE	322	37	7	Q	BD
KG0ZT (EN33)	322	37	7	Q	BD
N0VUQ (EN33)	110	22	5	Q	B
N0VUR (EN33)	105	21	5	Q	B
N0PUJ	42	21	2	Q	B
KB0RZZ (EN34)	16	4	2	Q	D
K0PSH (EN34)	14	7	2	Q	B
KB0WVD	4	2	1	Q	D
N0HBK	2	2	1	Q	B
N0HBS (+N0WYH)					
	12	4	2	L	BD

Missouri

K0WR	5,880	102	49	S	**ABD**
KB0SXS	4,305	86	41	S	**BD**
K0TLM	1,836	59	27	S	**ABCD**
N0IGZ	198	22	9	S	B

North Dakota

NT0V	2,550	46	34	S	**ABCD9EF**
WB0OAJ	672	32	21	S	**AB**
KB0LXX	136	13	8	S	ABD

Nebraska

WD0BQM	1,612	38	26	S	**ABCDE**
N0WJY	946	43	22	S	**B**
N0YNP	608	22	16	S	ABCDE

South Dakota

WB0HHM	4,042	72	43	S	**ABCD**
KG0MW	851	37	23	S	AB

Canada

New Brunswick

VE9AA	1,426	46	31	S	**AB**

Quebec

VE2JWH	1,554	74	21	S	**B**
VE2SHW	162	54	3	S	B
XL2PIJ (VE2PIJ,op)					
	2,160	82	20	Q	ABD
VE2CUA (VA2s ECM,GTX,MRX,VE2s ARW, DUB,HFX,HKI,JTX,ops)					
	6,402	153	33	M	ABCD
VE2CLD (VE2s CFA,GOG,ops)					
	1,161	100	9	L	BD

Ontario

VE3KDH	86,041	439	139	S	**ABCD9EF**
VA3ST	34,874	267	94	S	**ABCD**
VE3WCB	6,840	90	38	S	**ABDEF**
VE3FHU	6,380	96	58	S	ABCD
VE3SMA	5,130	100	38	S	ABCD
VE3SXE	3,870	85	43	S	ABD
VE3OJN	1,612	46	31	S	ABD
VE3NPB	1,050	38	21	S	ABD
VE3VHB	551	29	19	S	B
VE3TJD	300	20	15	S	AB
VA3ATH	285	57	5	S	B
VE3BFM (+VA3FIN)					
	9,555	95	49	M	BCD9EF
VE3TMG (+VE3DEB)					
	12,688	204	52	L	ABD

Manitoba

VE4AOJ	697	33	17	S	**BD**
VE4GLS	656	33	16	S	**ABD**

British Columbia

VE7XF	3,275	113	25	S	**ABD**
VE7CYT	115	23	5	S	A
VE7XO	40	10	4	S	AB
VE7PKE (+VE7s BKU,KNV)					
	516	34	12	L	ABCD

Marine Mobile

KS4KP	190	19	10	S	**AB**

Rovers

USA

Atlantic

KB3PW (+N2HKD)					
	68,187	520	51	R	ABCD9EFGHIP 6
WO2P	37,760	484	40	R	ABCD9EI 4
KA2CKI	34,408	359	46	R	ABCD9EFP 6
N2KXS	29,055	362	39	R	ABCD9EI 4
N3KKM (+N3XUD)					
	16,744	304	46	R	ABCD 7
NW2T	5,635	79	23	R	ABCD9EFGHIJ 3
N3LJK (+K3YWY)					
	3,240	98	27	R	ABC 6
N3WOE	1,180	98	10	R	BD 2
KG2EP	320	40	8	R	B 4
N1YR	140	28	5	R	B 3

Central

N9UIZ	13,414	248	38	R	ABCD 6
N9VZX	11,820	136	60	R	ABCD 12
N9SFN	11,100	126	60	R	ABCD 12
N8KWX	8,748	225	27	R	ABCDP 4
K9JK	5,876	148	26	R	ABCDE 4
N9KS	3,861	117	33	R	AB 8
K9TMW	2,816	121	22	R	BD 4
KA9BXG	2,336	67	29	R	BD 3
WA9FIH	1,320	60	15	R	ABCD 2
N9YZK	702	53	13	R	BD 3
N9QQB (+KB9LSP)					
	253	23	11	R	B 6

Dakota

N0MWH	5,694	78	26	R	BD9EFG 4
KC0P	4,896	171	24	R	ABDE 6
AB0DE	342	47	6	R	BD 2
KA0CRO	280	35	4	R	B 4
KB0TEH	85	17	5	R	B 2

Delta

KF4OHL	10,556	148	26	R	BDEIP 6
NT4L	2,312	47	34	R	ABCDE 9

Great Lakes

AB4CR	143,606	497	118	R	ABCD9EFIJ 10
N8ZCA (+KB8RXC)					
	6,633	163	33	R	ABCD 12
KF9US	4,368	88	39	R	ABCD 4
W8CBR	288	32	9	R	B 3

Hudson

N2UIO (+KB2ZGN)					
	13,580	215	28	R	ABCDIJ 4
N2MNZ	6,820	167	31	R	BD 10
KD2NE	3,320	132	20	R	ABD 4
KB2QPU	2,457	101	21	R	BC 4
N2OPJ	1,440	139	10	R	BC 4
N2UID (+KB2SRI)					
	810	64	10	R	BCD 3
N2XSE	770	53	11	R	BD 3
KG2JE	608	76	8	R	B 4
WA2BKN	133	19	7	R	B 3

Midwest

KE4FDP	408	32	6	R	BCDHI 0
K4GSX	216	27	8	R	B 3

New England

NR1L	109,368	574	93	R	BCD9EFG 10
KJ1K (+N1MU)					
	26,977	302	53	R	ABCD9EFGH 6
N1MJD	7,296	180	32	R	BD 9
N1TX	3,480	95	24	R	ABDE 2
N1SJK	2,826	129	18	R	ABD 3

Northwestern

KR8L (+KA8TER)					
	297	27	11	R	AB 3
K7SQ	286	26	11	R	B 2

Pacific

NC7K	82,820	767	82	R	ABD 18
KM6RH	5,797	130	31	R	ABCDE 6
KE6BZY	5,404	103	28	R	BCDE 7
KQ6DI	4,775	93	25	R	BCDE 2
K6LS	348	29	12	R	B 2

Rocky Mountain

NK5F	6,897	159	33	R	ABCD 5
N0UGY	910	21	8	R	BDFI 2
KB7TJM	352	25	11	R	BD 2

Southeastern

W3EKT	8,778	176	38	R	ABCD 4
WA5PSH	2,738	53	37	R	ABCDE 3
KD4BHH	2,139	83	23	R	ABD 4
AD4DY	1,320	55	24	R	AB 2

Southwestern

KB6JVV	9,870	80	21	R	ABCD9EFG HIJKLNOP 5
K6LMN	9,436	262	28	R	ABCD 3
KQ6CG	4,997	156	19	R	BCD 4
KQ6CU	912	50	12	R	BD 3
KC6UIX	429	33	13	R	AB 2
N6ZE (+KD6FOT)					
	135	15	9	R	B 3

West Gulf

WB5VYE (+WA5ZKO)					
	17,836	238	52	R	ABCD9E 10
N5VBK	10,549	103	77	R	BD 11
KK5RH (+KD4JDT)					
	10,300	171	50	R	ABD 12
W5DF (+AB5SS)					
	4,402	100	31	R	ABDEP 6
KC5LYX (N2NQI,WW2R,ops)					
	2,106	52	27	R	ABCD9 3
WB5LUA	1,343	50	17	R	ABD9E 4
WA5VJB	612	25	12	R	ABCDHJP 2
AA5C	610	36	10	R	ABDE 3
WA2TSF	560	40	14	R	B 6

Canada

VE3OIL	2,575	62	25	R	ABCDE 4

Checklogs

K5MAT, K0JQA, KA8WBQ, KC6WLC, N2EZS, N2VIZ, N3RBW.

1996 ARRL November Sweepstakes Phone Results

By **Randall A. Thompson, K5ZD**
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and
Billy Lunt, KR1R
Contest Manager

Alan's body ached and his movements had become almost automatic. His blurry eyes were focused intently on the computer screen sitting above the radio. Information flowed without hesitation from the headphones directly to his fingers. After nearly 24 hours in the operating chair, he no longer had to think about the mechanics of logging each QSO.

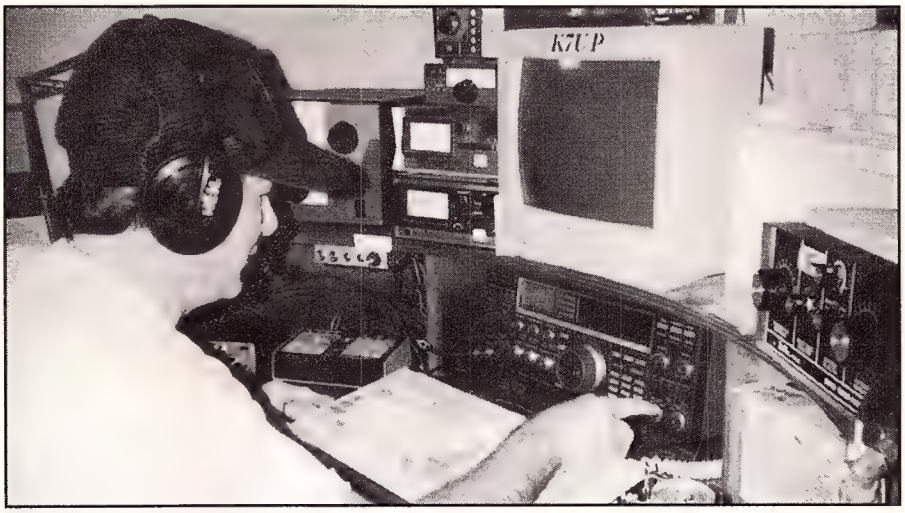
It was the third weekend of November and Alan was nearing completion of the 1996 version of his annual love affair with the ARRL November Sweepstakes. The long exchange of number, precedence, call, check, and section was not only a challenge to copy, but to say as well. He wondered which hurt more—his throat, his ears or his back.

Despite the minor discomforts, Alan was having a blast. He was nearing a personal-best QSO total. He needed only one more section to have the Clean Sweep and earn a coffee mug. The challenge of competing against himself, other competitors, propagation, equipment failures, and a long tradition kept him coming back year after year.

With only a short time left to go, Alan began tuning for the missing section. He passed across the big signals of the high power entrants with their amazingly high numbers. With all the new vanity call signs it was hard to tell who was who. He stopped and listened to N7TR in Nevada. "That sure sounds like KI3V," he thought. A few kilohertz later he found N2IC in Colorado. He stopped for a moment to listen with N7TR in one VFO and N2IC in the other. They were in a close race and begging for every last QSO. It was like watching two thoroughbreds pounding down the stretch. Alan also heard K9RS giving out big numbers. While you could never tell exactly where everyone stood until the end of the contest, having the QSO number in the exchange made it easy to follow the progress of the leaders—as well as the competition across town.

Thinking of his competition, Alan refocused on finding the last multiplier to improve his score. "Should I call CQ and hope it comes to me, or tune and try to find it?" Alan considered. It was a strategy decision he was constantly evaluating. There were always new stations that showed up just for the fun of being fresh meat during the final hours. Some of them call CQ and let the big scorers find them, while others are content to tune up the band and answer. Alan decided to tune quickly and keep an ear out for a clear frequency where he could call CQ.

As the minutes ticked down, Alan's excitement level kept rising. With each QSO added to the log he raised his personal-best for *contacts*, but still needed that last multiplier to accomplish a personal-best *score*. His eyes narrowed and the minor aches and pains were completely forgotten. Alan really wanted to add to his set of Clean Sweep coffee mugs and he was trying everything he could think of to entice that last section into his log. "This," thought Alan, "is fun!"



Mike, W5FX, at the helm of the K7UP effort in New Mexico.

High Power Category

Yes, Alan, N7TR is the new call sign of Rich, KI3V, perennial top-ten ace and former SS phone champion (1993). Rich initiated his new call sign in a big way with a narrow victory in the high power category. Rich started off with 173 QSOs in the first hour of the contest and his first six hours were each over 100 – that's some fast talking!

Right on his tail the entire way was another prior SS phone winner Steve, N2IC. Steve had a personal-best 175 QSOs in the first hour and was never more than 25 QSOs behind Rich throughout the contest. After finishing second last year, Steve had high hopes to move into the top spot this time. Perhaps not having a new call sign to debut was the difference.

Third place went to Steve's WRTC-96 operating partner, Dave, K6LL. Every year Dave makes incredible scores from his Arizona home using just a tribander and wire antennas. Over the last 10 years, he has national finishes of third, third, fourth, fourth, third, fourth, second, second, sixth and third. This amazing record of performance deserves a first-place finish—maybe next year.

Jon, N5JA (ex-AA5BL), put a shine on his new call sign by fighting through a series of broken antennas and unheard alarm clocks to repeat his fourth-place finish of a year ago. He had over 1000 QSOs on both 20 and 40 meters, which is probably the first time this double has ever occurred in the SS.

Gary, VE7NTT, piloted VE7SZ to fifth place and the first appearance of a Canadian entry to the top ten in over 10 years! Todd, WDØT, operated WØSD to the exact same score as last year and moved up a place to sixth. George, WB5VZL, introduced his new K5TR call to finish seventh.

Top Ten

Single Operator, QRP		Single Operator, Low Power		Single Operator, High Power		Multioperator	
W7YAQ	104,720	WP2Z (K8MJZ,op)	243,320	N7TR	354,276	K9RS	355,524
K5ED	85,500	VE4GV	231,770	N2IC	352,092	W5WMU	326,664
N7MZW	69,864	K7FR	225,888	K6LL	338,364	KW8N	325,728
K7MM	62,928	K7QQ	225,264	N5JA	330,564	K6RCC	323,388
K5IID	56,672	NA5S (KE5CV,op)	221,052	VE7SZ (VE7NTT,op)	325,260	W3GH	319,176
K5OT	55,328	KK9A	216,528	WØSD (WDØT,op)	321,048	W4WA	303,108
AA7VY	52,052	W7ZRC	215,748	K5TR (at W5KFT)	319,550	N4ZZ	292,344
W1VT	51,208	NØAT	213,096	K5RX	309,192	W7GG	282,828
KD2TT	50,100	N5DX	207,792	N5KA (at N3BB)	306,228	KØTQ	278,148
KX9X	48,706	WA4ZXA	191,568	K4VX (K9PG,op)	297,492	K5MR	268,320

Top Five—Phone

Boxes list call sign, score and class (Q = QRP, A= Low Power, B = High Power, M = Multieoperator).

Northeast Region (New England, Hudson and Atlantic Divisions; Maritime and Quebec Sections)			Southeast Region (Delta, Roanoke and Southeastern Divisions)			Central Region (Central and Great Lakes Divisions; Ontario Section)			Midwest Region (Dakota, Midwest, Rocky Mountain and West Gulf Divisions; Manitoba and Saskatchewan Sections)			West Coast Region (Pacific, Northwestern and Southwestern Divisions; Alberta, British Columbia and NWT/Yukon Sections)		
W1VT	51,208	Q	K5IID	56,672	Q	KX9X	48,706	Q	K5ED	85,500	Q	W7YAQ	104,720	Q
KD2TT	50,100	Q	KT4LD	39,936	Q	WA8RJF	31,950	Q	N7MZW	69,864	Q	K7MM	62,928	Q
W2CE	32,412	Q	KS4DU	12,036	Q	K8LJQ	19,440	Q	K5OT	55,328	Q	AA7VY	52,052	Q
WZ2T	25,172	Q				N8JM	12,600	Q	AB5WB	45,440	Q	W6CN	35,520	Q
N3IGA	23,048	Q				W9DZ	12,400	Q	WØCO	42,624	Q	K7RAT (N6TR,op)	34,272	Q
K1RA	174,096	A	WP2Z (K8MJZ,op)	243,320	A	KK9A	216,528	A	VE4GV	231,770	A	K7FR	225,888	A
KZ1M	171,444	A	N5DX	207,792	A	W8MJ	190,632	A	NA5S (KE5CV,op)	221,052	A	K7QQ	225,264	A
N5OKR/3	120,900	A	WA4ZXA	191,568	A	K8JZ	175,656	A	NØAT	213,096	A	W7ZRC	215,748	A
W2EQ	119,016	A	AB5SE	144,760	A	WAØAVL	133,848	A	WAØX	181,272	A	VA6JO	180,180	A
WA3HAE	115,284	A	WO4O	123,864	A	WA1UJU	131,516	A	K7CF	168,636	A	K6RO	170,352	A
WB2K	280,332	B	K4AB	282,828	B	WE9V (at KS9K)	292,344	B	N2IC	352,092	B	N7TR	354,276	B
K3MM	256,308	B	K4VUD	274,092	B	K8CC (K9TM,op)	272,064	B	N5JA	330,564	B	K6LL	338,364	B
WB1GQR (W1SJ,op)	250,068	B	N4UK	265,696	B	AA8U	247,572	B	WØSD (WDØT,op)	321,048	B	VE7SZ (VE7NTT,op)	325,260	B
AB2E	226,200	B	K4ZA	259,428	B	K9BGL	234,780	B	K5TR (at W5KFT)	319,550	B	WC6H	292,138	B
KQ2M	204,000	B	W4MYA	255,528	B	K8MZ	223,860	B	K5RX	309,192	B	W7RM (K7ST,op)	291,564	B
W3GH	319,176	M	W5WMU	326,664	M	KW8N	325,728	M	K9RS	355,524	M	K6RCC	323,388	M
K3CR	261,612	M	W4WA	303,108	M	NU8Z	246,480	M	KØTQ	278,148	M	W7GG	282,828	M
KE3Q	254,592	M	N4ZZ	292,344	M	KG8CW	233,064	M	K5MR	268,320	M	N6KI	265,512	M
K1NG	240,396	M	N4CM	238,524	M	W8JJ	200,460	M	K5DU	242,112	M	K7IR	254,592	M
K1RQ	230,880	M	K1GG	222,456	M	N9QX	195,624	M	WØGG	204,516	M	W6UE	245,856	M

The notable scores from "back east" were WE9V, who finished 12th, and WB2K in 18th place. Without the short skip of the past two years and the long skip on 75 meters after dark, the East Coast had none of the tools it needed to keep up with the south and west.

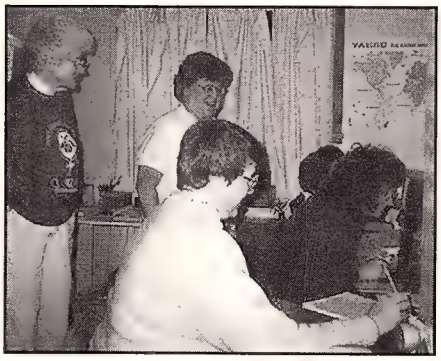
Low Power Category

Victory in the low power competition was a classic battle between warm tropical breezes and frigid blowing snow. Stan, K8MJZ, headed south from his Michigan home to operate WP2Z in the Virgin Islands. This was the same station that K8HVT used to win the CW low power category just two weeks earlier. Stan made most of his contacts on 15 meters, where he enjoyed a significant propagation advantage and low QRM. Too bad he missed nearby KP4 for the Sweep!

Meanwhile, last year's low power champion Rob, VE4GV, was just trying to keep his antennas pointing the correct direction in a snowstorm and 60 mph winds. He blames missing KH6 on not being able to get the beam to turn past north because of the wind. Rob made all but 12 of his contacts on 20 and 40 meters, to finish in second place.

The race for third was an exciting photo finish between Gary, K7FR, in Eastern Washington and Rex, K7QQ, in Western Washington. After 24 hours of intense operating, they ended up only four contacts apart! Gary achieved a personal-best score and beat one of his contesting heroes. As he put it, "This was absolutely the best SS *ever!*" Rex won the low power category back in 1993 and is sure to request a rematch. Competition is what contesting is all about.

Fifth place went to Mike, KE5CV, operating NA5S in North Texas. KK9A submitted the best score from the "black hole" of the Midwest and earned the number six spot. Special recognition is due to Jim, WA4ZXA, who finished in tenth place. Not only did he have the best score from the eastern half of the country, but did it while operating under the influence of medication to fight the pain of a kidney stone. Ouch!



Jean, AA8KI, and Peg, KB8NPA, (l-r, standing) look on as Judy, KC8BOM; Byrness, W8LE(hidden); and Carol, KB8VYB (seated, foreground); operate the Buckeye Belles station, W8MBI.

QRP Category

The QRP category went to the guy who wanted it the most. Bob, W7YAQ, operated the full 24 hours allowed by the rules to earn the victory. Bob is an experienced SS QRP entrant who moved up from finishing third last year. Even though he missed Maritime for the Sweep, a healthy QSO advantage allowed him to cruise in for a clear victory. K5ED operated only 18 hours and missed two sections, but still captured enough QSOs to finish second. Charles, N7MZW, took advantage of being in the relatively rare Wyoming Section to finish third, just ahead of K7MM in Eastern Washington. Best score from the Northeast was Zack, W1VT, who finished in eighth, a bit ahead of KD2TT. No one in the QRP top ten managed to capture a Clean Sweep of all sections.

Multi-Operator Category

The multi-operator champion was again the team at K9RS—for the third year in a row! With their dynasty ended on CW (where they use the call sign AA5B), the New Mexico boys are now the ones to beat on phone. Second place belongs to W5WMU in Louisiana, who moved into the multi-op category for the first time after many years of high power single op success. The KW8N gang in Ohio takes third, just ahead of the River City Contesters at K6RCC.

Regional Competition

In the Northeast region, K1RA dominated the low power category. WB2K operated from K2WK to win high power with a personal-best score. W3GH took the region's multi-op honors for the fourth time in a row.

Down in the Southeast, WP2Z got by newcomer N5DX for low power. K4AB won high power over a super-competitive pack of ops. W4WA and N4ZZ gave chase to W5WMU in the multi-op category.

The Central region featured KK9A's nice low power score, with W8MJ not far behind. WE9V operating at KS9K and K9TM at K8CC duplicated their one-two finish of a year ago. KW8N continued to dominate multi-op for the region.

In the Midwest, all five members of the high power box also made the national top ten! NØAT, KØHB, and NØIJ had a friendly competition and all finished within a few QSOs. NØAT gets the moral victory and bragging rights, since he was running only low power. This region had the best collection of QRP scores.

Out West there were some real shootouts! K7FR took low power honors. N7TR led the high power race over Arizona "sharpshooter"

ARRL November Sweepstakes Plaque Winners

Listed below are all of the plaque category winners. Only plaques with sponsors will be awarded. If you have won a plaque category without a sponsor, you may purchase your own plaque. The cost is $50 per plaque. If you, your club, or business is interested in sponsoring any of the unsponsored plaques call Billy Lunt, KR1R, at ARRL HQ.

Category	*Winner*	*Donor*
Overall		
QRP Phone	W7YAQ	ARRL
Low Power Phone	WP2Z (K8MJZ,op)	ARRL
High Power Phone	N7TR	Carl Cook, AI6V
Multioperator Phone	K9RS	Central Texas DX & Contest Club
Atlantic Division		
QRP Phone	W2CE	
Low Power Phone	K1RA	Potomac Valley Radio Club
High Power Phone	K3MM	North Coast Contesters
Multioperator Phone	W3GH	Mark Sickmeyer, KB3GJ, Memorial
Central Division		
QRP Phone	KX9X	
Low Power Phone	KK9A	Society of Midwest Contesters
High Power Phone	WE9V (at KS9K)	
Multioperator Phone	N9QX	
Dakota Division		
QRP Phone	W0YHE	Tod Olson, K0TO
Low Power Phone	N0AT	Twin City FM Club
High Power Phone	W0SD (WD0T,op)	Minnesota Wireless Assn, W0AA
Multioperator Phone	KR0B	Minnesota Wireless Assn, W0AA
Delta Division		
QRP Phone		
Low Power Phone	N5DX	Pat Sonnier, W5WMU
High Power Phone	WA5OYU	
Multioperator Phone	W5WMU	
Great Lakes Division		
QRP Phone	WA8RJF	
Low Power Phone	W8MJ	Mad River Radio Club
High Power Phone	K8CC (K9TM,op)	North Coast Contesters
Multioperator Phone	KW8N	
Hudson Division		
QRP Phone	KD2TT	
Low Power Phone	W2EQ	Troy ARA
High Power Phone	WB2K	John Hults, K2WJ
Multioperator Phone	KY2J	Hudson Valley Contesters and DXers
Midwest Division		
QRP Phone	N0EID	
Low Power Phone	WA0X	
High Power Phone	K4VX (K9PG,op)	
Multioperator Phone	K0TQ	
New England Division		
QRP Phone	W1VT	
Low Power Phone	K1VUT	
High Power Phone	WB1GQR (W1SJ,op)	Ed Parsons, K1TR
Multioperator Phone	K1NG	
Northwestern Division		
QRP Phone	K7MM	Steve Morris, K7LXC, and Tower Tech
Low Power Phone	K7FR	
High Power Phone	N9ITX/7	
Multioperator Phone	W7GG	
Pacific Division		
QRP Phone	WB6FZH/KH6	
Low Power Phone	W6PYX	Jim Hollenback, WA6SDM
High Power Phone	WC6H	Richard Hallman, N7TR
Multioperator Phone	K6RCC	
Roanoke Division		
QRP Phone	K5IID	
Low Power Phone	WA4ZXA	Jim Stevens, K4MA
High Power Phone	N4UK	Potomac Valley Radio Club
Multioperator Phone	K1GG	Shenandoah Valley ARC
Rocky Mountain Division		
QRP Phone	N7MZW	
Low Power Phone	K7CF	
High Power Phone	N2IC	
Multioperator Phone	W0GG	
Southeastern Division		
QRP Phone		
Low Power Phone	KD3GC	
High Power Phone	K4AB	
Multioperator Phone	W4WA	
Southwestern Division		
QRP Phone	AA7VY	Ray Day, N6HE, and Donna Day, N6HTH
Low Power Phone	K6RO	
High Power Phone	K6LL	
Multioperator Phone	N6KI	
West Gulf Division		
QRP Phone	K5ED	
Low Power Phone	NA5S	D. Craig Boyer, AH9B
High Power Phone	N5JA	Leo E. Oyler Jr, W0GOW—W5RO Memorial
Multioperator Phone	K5MR	Oklahoma DX Assn
Canada		
QRP Phone	VE6GK	
Low Power Phone	VE4GV	Sam Ferris, VE5SF
High Power Phone	VE7SC	D. Craig Boyer, AH9B
Multioperator Phone	VA6JY	

Third Annual Collegiate Championship

The 1996 Collegiate Championships was again held during the ARRL Sweepstakes. This year's event saw two new champions take top billing, with Penn State University, K3CR, taking the Phone and Combined categories, while Caltech, W6UE, was tops on CW.

School participation was up dramatically from last year, with 19 entries on CW and 25 on phone. If you would like to see the Collegiate Championship become an official category of the November Sweepstakes, contact your Contest Advisory Committee representative. For more information and complete results contact Robert Barron, Box 180703, Austin, TX 78718; e-mail **barron@liant.com**.

Top CW Scores

Call Sign	*School*	*Score*	*Conference*
W6UE	Caltech	118,872	
N4YDU	North Carolina-Charlotte	113,616	ConfUSA
K3CR	Penn State	112,200	Big10
W5EHM	Univ of Texas	103,500	Big12
W4ATC	North Carolina State U	91,200	ACC
W8EDU	Case Western Reserve U	88,242	

Top Phone Scores

Call Sign	*School*	*Score*	*Conference*
K3CR	Penn State	261,612	Big10
W6UE	Caltech	245,856	
W5EHM	Univ of Texas	194,688	Big12
W5YM	Univ of Arkansas	145,704	SEC
W1YK	Worcester Poly	139,152	
W6BHZ	California Poly	137,060	BigWest

Top Combined Scores

Call Sign	*School*	*CW*	*Phone*	*Total*
K3CR	Penn State	944	1000	1944
W6UE	Caltech	1000	940	1940
W5EHM	Univ of Texas	871	744	1615
W4ATC	North Carolina State	767	431	1198
W3EAX	Univ of Maryland	618	322	940
W6BHZ	California Poly	236	524	760

Other schools ranked in the combined scores included Baylor University, KC5OJY; University of Idaho, W7UQ; University of Chicago, WO9S; University of Wisconsin–Milwaukee, WB9JBF; University of Arkansas, W5YM; Harvard, W1AF; Purdue, W9YB; University of Missouri–Rolla, W0EEE; and University of Delaware, WA3GAY.

K6LL. It's nice to see W7RM's call sign appear in the results, this time with "hired gun" K7ST. Multi-op was a showdown between K6RCC (W6GO in disguise) and W7GG (the new call for AI7B).

Club Competition

The Potomac Valley Radio Club turned out an incredible 117 entries to win the Unlimited category of the Affiliated Club Competition. They broke the four-year winning streak of the Northern California Contest Club, which finished second. The rejuvenated Yankee Clipper Contest Club was a strong third. In the Medium club category, the Society of Midwest Contesters bested the North Texas Contest Club in a close race. In the Local category, perennial winner River City Contesters took top honors. Look out for the Central Texas DXers and Contesters, who achieved second place in their first Sweepstakes club entry.

Final Notes

ARRL HQ received 1481 phone entries, consisting of 1162 single operators, 305 multiops, and 14 checklogs. Of the single ops, we had 57 QRP, 796 "A power" (<150 W), and 309 "B power" logs. Special congratulations to all that earned a Participation in No-

Affiliated Club Competition

	Score	Entries	CW Winner	Phone Winner
Unlimited Category				
Potomac Valley Radio Club	8,875,578	117	KE3Q	K3MM
Northern California Contest Club	7,409,132	77	N6RO	N7TR
Yankee Clipper Contest Club	6,106,238	83	W2PV (WZ1R,op)	KC1F
Mad River Radio Club	4,893,534	52	K8CC	K8CC (K9TM,op)
Medium Category				
Society of Midwest Contesters	4,819,536	43	WØSD (WDØT,op)	WØSD (WDØT,op)
North Texas Contest Club	4,341,988	32	KRØY	N5JA
Southern California Contest Club	3,032,874	23	K6LL	K6LL
Frankford Radio Club	2,944,784	40	N2MM	WB2K
Minnesota Wireless Assn	2,633,264	25	KØIJL	NØAT
Texas DX Society	2,314,846	21	N5JJ (K5GA,op)	W5ASP
North Coast Contesters	2,131,830	24	VE3EJ (NJ2L,op)	K8BL
Kentucky Contest Group	2,110,814	29	N4AR	W9AU
Florida Contest Group	1,864,934	25	N4BP	K4VUD
Rochester (NY) DX Assn	1,643,202	27	W2TZ	W6XR
Western Washington DX Club	1,571,720	16	NN7L (NL7GP,op)	W7RM (K7ST,op)
Mile High DX Assn	1,231,598	11	KØKR	KØKE
Hudson Valley Contesters and DXer	1,230,672	11	NA2N	N2NFG
Woodbridge Wireless	1,119,530	18	WB4RDV	KJ4VG
Weekend Warriors	1,072,356	10	WA3HAE	WA3HAE
Willamette Valley DX Club	1,007,916	8	W7RM (AA7NX,op)	K9JF
Tennessee Contest Group	887,736	5	N4ZZ	—
New Mexico Big River Contest Club	853,326	3	—	K2EI
Salt City DX Assn	751,364	11	K2KIR	AJ3K
Southeastern DX Club	739,336	9	W4BTZ	N4UK
Oklahoma DX Assn	690,098	9	K5YAA	K5KA
Nashville ARC	655,174	4	WA6KUI	WO4O
Murphy's Marauders	625,940	15	K1RM	NQ1K
Northwest ARS	615,334	16	N5BA	K5NZ
Motor City Radio Club	594,626	37	K8RDJ	K8RDJ
Kansas City DX Club	529,288	4	KMØL	KMØL
Grand Mesa Contesters	527,696	8	NØZA	KBØUGE
Murgas ARC	475,672	11	WA3YON	WB3FAA
AK-SAR-BEN	460,298	11	NV3L	K9RZ
Lincoln ARC	455,760	3	KBØJSU	—
South Jersey Radio Assn	433,014	15	W2ESX	N2FY
Northrop Grumman Radio Club	432,800	8	K6HRT	W6CN
Radio Club of Tacoma	399,930	11	N7ETC	N7DOE
Rip Van Winkle ARS	382,514	12	N2JOH	KF2LW
Twin City Ham Club	370,674	4	—	N5MYH
Valley Radio Club of Eugene	370,158	7	K7DBV	AI7W
Central Michigan ARC	355,046	13	W8TJQ	KC8CY
Providence Radio Assn	300,482	6	K1VSJ	W1OP (K1PLX,op)
Northern Arizona DX Assn	299,888	9	W7YS	NF7E
Hazel Park ARC	266,328	17	WD8S	WD8S
Long Island Mobile ARC	266,150	7	K2AU	KS2G
Schenectady ARA	265,008	6	K2UF	K2UF
Roanoke Valley ARC	264,914	12	K4UK	K4PK
Fon du Lac ARC	234,592	6	W9MSE	ND9O
Southwest Ohio DX Assn	223,462	4	KF8GE	KF8GE
Eastern Iowa DX Assn	220,618	4	KK9W	WØOF
Southern California DX Club	215,608	4	W6HT	K6RO
Massasoit ARA	206,036	3	K1VUT	K1VUT
Western New York DX Assn	198,448	6	KW2J	WB2WPM
Highland ARA	197,258	6	KJ8I	KJ8I
Ozaukee Radio Club	185,070	5	W9LO	K9CAN
Colorado QRP Club	174,048	3	KØFRP	—
Livingston ARK	147,012	4	WD8NFX	WW6I
Mother Lode DX/Contest Club	144,888	4	K6BPB	—
Fresno ARC	138,786	5	WB6ITM	WE9A
Mississippi Valley DX/Contest Club	133,326	5	KMØR	KMØR
Northern New York Contest Club	119,652	8	N2MD	N2TNW
Gwinnett ARS	117,056	3	AJ1T	KD3GC
Sheboygan County ARC	110,848	3	AA9RB	K9XJ
Brockport ARK	108,446	5	N2WK	KG2BW
OH-KY-IN ARS	105,236	5	—	WA6EZV
Troy ARA	81,732	4	AA2WQ	KF2WA
Outlaw Wireless League	69,618	4	WT3H	WB3AAL
Lynchburg ARC	69,018	3	WB4ZPF	WB4ZPF
Wichita ARC	61,112	3	KFØM	NIØS
Green Valley ARC	22,510	3	—	W7ZT
Local Category				
River City Contesters	1,896,224	10	W6GO (N6IG,op)	—
Central Texas DX and Contest Club	1,063,546	10	K5NA	N5KA (at N3BB)
Central Arizona DX Assn	953,486	7	KY7M	W7ZMD
Federation of Amateur Radio Operators	737,782	7	K9BGL	K9BGL
Carolina DX Assn	565,754	4	—	K4ZA
Great Falls Area ARC	317,080	3	AA7BG	KJ7VP
Vicksburg ARC	239,424	5	W5XX	N5QDE
West Park Radiops	215,188	9	W8PN	WD8AJF
Eastern Connecticut ARA	207,588	4	N1OPZ	KZ1M
Orange Park ARC	155,638	4	W5HUQ	K2DF
Baton Rouge ARC	153,476	4	KC5ZZ	N5SMQ
CT RI Contest Group	142,810	5	N1HRA	N1RJF
Mike and Key ARC	136,338	4	WA7UVJ	WA7UVJ (N7WA,op)
North Shenandoah DX Assn	123,268	4	N4MM	N4MM
Hamfesters Radio Club	116,836	5	W9LNQ	AK9Y
East Coast DX Assn	102,024	3	—	WB2RQX
Sturdy Memorial Hospital ARC	96,318	3	WZ1K	WZ1K
Sterling Park ARC	87,926	3	K4GEL	W2YE
American Red Cross Emergency Communications Service	73,116	4	—	WB2AYQ
Poinsettia ARC	66,658	7	W6BKY	W6BKY
Old Barney ARC	63,970	5	N2OO	N2OO
Southern Peninsula ARK	47,076	4	N4JEO	KK4R
Raleigh ARS	44,524	3	AD4PU	KE4RHU
Great South Bay ARC	41,340	3	—	KA2D

vember Sweepstakes (PINS) pin! All PINS awards were mailed in January, so you should have received yours by now.

Special thanks to Administrative Assistant Sharon Taratula for her help in preparing the results. Mark your calendar now for the 1997 ARRL November Sweepstakes: CW is November 1 to 3 and Phone is November 15 to 17.

SOAPBOX

On 20 meters, I couldn't get through pileups when calling stations that were S9 + 20 dB—I had better luck with S7 signals on clear frequencies. On 40 meters, I was thrilled with Ohio and Virginia contacts QRP. Thanks to those who turned their beams to bring me through (WB6FZH/KH6). I usually don't do SSB, but I got caught up in the activity (KJ5WX). The bad news is my computer crashed 18 hours into the contest; the *good* news is that it was three contacts after my Clean Sweep and that it later recovered the log (K9CC). This was my first contest with the new call sign, and it sure was nice. I could even finish the exchange without gasping for breath (W4NF). My first SS and I had a blast. (VY2LI). Fifteen meters was in fantastic shape Sunday afternoon. Even without 20 meters, I worked 62 sections in eight hours (AA9RB). I need a new call sign; no one gets this one right (AC4OC). Had to use a standby rig with hand mike. The ice storm froze the Yagi to NW and raised the SWR on all my antennas; when it melted, the power blips reset the computer for a while. Is that enough excuses? (KØBJ). The "honey do" list included getting my wife's car inspected, handling the storm windows, and going to the doctor. Still I squeezed in 12+ hours. What a contest! (KD3VX). My first-ever Sweep...and it felt *good* (N1NQD). Finally—a

Is this picture before or after the contest? Bob, W7LRD, still looks refreshed and ready to go.

Clean Sweep (K9QYC). I woke up on Sunday morning with a kidney stone. Went to the ER and came back and finished the contest. It cost me two hours operating time and stopped me from breaking 200k. I feel I deserve the Ironman Award at least for this test (WA4ZXA). Once again, I missed the sweep by one section; this time it was North Dakota. Special thanks to the neighbors for letting me "string" the 40 and 80 meter wires across their yards (WA3SES). As it is each year, SS was a lot of fun. This year was even more special, as I have a new vanity call sign (K1GG). An incredible luxury to have a short call sign! What a difference from CW—I could find Wyoming. More Wyoming than Montana this time, as a matter of fact (N4AF). The closest I have been to a Clean Sweep. I hope that, next year, I can qualify for that Clean Sweep coffee mug (VE6DBH). We drove over 500 miles to ND, survived and operated a portable station through a blizzard, and had a very good time. We want to thank the ARRL for running this contest (KIØBZ). Once again foiled by Alaska, Quebec and the Yukon (AD4DG). Being a little gun is still fun. The big stations are looking for you. But by Sunday night, the contacts were extremely hard to come by (AA9RK). First contest with my new call sign. Many fewer requests to repeat my section than when I was K8JLF. I also learned what other call signs K1HT can be confused with (K1HT). Where were Northern New York, Quebec and Delaware? I was those three short of a Clean Sweep...but not bad, considering this was the first time I really attempted to win the coveted coffee mug. I was wishing for that mug to be delivered at 1300Z, full of double-caffeinated coffee (KC6VVT). First time running two radios simultaneously. Some confusing moments, but it's the way to go (K2UF). A great time was had by all. The first contact after getting up on Sunday was NP4A for the Clean Sweep. My eyes were still half closed (NU8Z). Nothing like having to check into the club net to work one's own section for a multiplier. QRP on 160, etc, was nice for laughs; in SS, it is a lesson in frustration (W2CE). Using my new call sign on the air for the first time took some getting used to. The conditions were definitely not as good from the Northwest as they were in the CW SS (K7NT). New call sign worked FB (K5ZO). Drat! I missed VY1/VE8. I was trying to do 78 sections with 78 contacts, as I couldn't spend a lot of time contesting this weekend (VE9AA). Lots of fun with my 1×2 call sign (N9CO). If I'm going to start working phone contests, I will have to get another mike. Push-to-talk with a hand mike makes computer logging a real challenge (KK4R). Halfway through the run on 40 meters Sunday, my throat became very sore. Habit got the better of me, as I hit the foot switch while making an emergency call to my wife using the shack phone. So the folks on my fre-

quency heard "CQ contest from KS4XG. Bring me a can of soda quick. I'm dying!" (KS4XG). Just searched and pounced, with limited time to operate (W8FN). I'm amazed at the number of QSOs made with poor antennas at the bottom of the cycle. Really looking forward to the operating next year, with aluminum instead of wire antennas (KQ2M). First-ever single op all-out effort for SS. After a marathon week of station/antenna rebuilding/improvements...and it all paid off (KJ4VG). Fourteen new states! Please return QSLs, gang (KT4OC). Being an older ham and a computer "illiterate" with an old XT computer, I could use lotsa practice. I hope all the attachments are the correct ones (KC3LV). Thunderstorms kept me from getting on the air until Sunday morning. Then big trouble caused me to miss QSOs Sunday afternoon (KC5OZT). After 34 years, my first SS. Great fun; I'm waiting for next year (WA5DJU). I worked three more telephones, two TVs, and one VCR toward my "RFICC." (W9UR). First serious phone SS for me in 10 years. Forty meters was very poor here in VE7, but 20 was really, really fantastic (VE7SC). Operating portable at Mount Peavine, near Reno, Nevada, at 7800 feet. In and out via four-wheel drive, which was also the operating shack. Experienced snow, freezing rain, and 50 mph winds. It was cold. It was worth it (W6IXP/7). Made a couple of tactical errors but won't ever make them again. Lots of comments about being the last for the Sweep. Didn't think South Carolina was all that rare (N4UK). My first November SS, and I had a ball! Special thanks to N5FG in Mississippi for his patience while I battled QRM for his multiplier (KE4JZY). Achieved my goal of 100 QSOs. Enjoyed every minute of it (WA3RBK). Fifteen and 20 meters were good during the daylight hours, but nothing could be heard on 10 meters. However, the contest was still fun (VE6ATT). The goal for next year will be to increase my QSO rate by 20% (AA8R). My amplifier started arcing within the first hour. I fixed it, then it started arcing again later. Murphy was here this year (KFØGV). Was *anyone* operating from the Virgin Islands? (ACØE). I'm not cutthroat enough to pile in or belly up yet. But I was excited by all the adrenaline flowing and the good attitudes displayed by the contesters. I was amazed by someone who had a "flying saucer sound effect" trying to clean out a frequency (WB9YSM). It took me several dozen contacts to get used to saying my new vanity call sign (K9ARF). I worked Montana, Wyoming, Manitoba and then the Yukon within my *first five* QSOs of the contest. What a bummer. Now I had no excuse to miss the Sweep (N3RR). By far and away, the Sweep was a real thrill and a moment I will always remember. Thanks to Jay, VY1JA, for the Magic Moment (KK5GT). Had a blast...literally—80+ mph winds three hours into the contest (NY5B). The extra section this year made it that much harder to get a Sweep (KB4GID). Puerto Rico must have went on strike—we never heard them (NJ5S). Five watts is a whole lot easier when you're sitting in Wyoming (N7MZW). The flu sure cuts down on operating time (NA2Q). The good news—I worked 77 sections. The bad news—this year there were 78. Where was Quebec? (KG8QL). Thank goodness for Beverage antennas; they certainly helped on 75 meters (W8MJ). Wow! What happened to 40 meters on Saturday night? (KG8CW). Unfortunately, many didn't hear me calling, with my 100 W from Northern New York. I did my best to get everyone in my log (K2NNY). It sure is sweet to work a Clean Sweep. Thanks to all! (VE3VET). This is still a fun contest, even with low sunspots (KK9A). I finally got my 16-year-old son to operate in a contest. His involvement meant more to me than the score (W4DC). A real treat for my first contact to be VY1JA (WØGG). It's amazing how stuff works until you really need it. My home-brew headset-to-radio adapter went intermittent in the second hour. Fortunately, I had a backup adapter—but who knows how many QSOs I missed before I discovered the problem? (KE4OAR). Great couple of hours on 15 meters. My local noise temporarily gone and good conditions yielded about 100 QSOs per hour for a few hours (W7ZMD).

Scores

Within each section, scores are listed in desending order, by power categories, followed by multioperators. Line scores list call sign, score, QSOs, multipliers, hours, class (Q = QRP, A = Low Power, B = High Power, M = Multioperator).

USA

1

Connecticut

W1VT	51,208	346	74	24	Q
AB1I	18,880	160	59	11	Q
N1KLB	6,240	80	39	24	Q
W1XF	57,760	380	76	14	A
NX1Q	43,200	300	72	10	A
W1ECH	36,062	247	73	9	A
N2BQA	34,164	234	73	17	A
W3EP	32,550	217	75	9	A
AB1U	19,154	157	61	8	A
KE1AU	15,360	128	60	8	A
W1JN	8,640	108	40	6	A
KD1XS	8,364	102	41	5	A
K1KAV	4,810	65	37	7	A
K1DII	2,240	40	28	2	A
KQ2M	204,000	1360	75	21	B
W1QK	75,696	498	76	24	B
NQ1K	68,096	448	76	14	B
N8RA	57,684	418	69	9	B
K1NYK	45,240	348	65	9	B
N1JW	16,464	147	56	5	B
KC1OH	11,280	120	47	6	B

KB1BQZ (K1JN,KA1VMG,KB1LN, KE1FK,N1HRA,ops)
110,604 709 78 24 B

N1NQD (+net)
54,600 350 78 20 B

W1NG (+net)
40,716 261 78 24 B

N1MM (+net)
37,268 242 77 24 B

N1MD (+net)
23,856 168 71 24 B

K1DW (+net)
15,504 152 51 5 A

WA1PMA (+net)
12,324 79 78 8 B

WS1F (+ops)
12,168 78 78 10 B

Eastern Massachusetts

K1VUT	106,580	730	73	24	A
K1EP	52,592	346	76	23	A
W1EM	30,380	217	70	15	A
K1HT	27,648	216	64	8	A
W1TI	25,600	200	64	9	A
WZ1K	23,184	184	63	15	A
KC1SQ	15,618	137	57	5	A
WA1OLV	14,416	136	53	6	A
AI6E	13,720	140	49	3	A
N1OEF	11,280	120	47	16	A
K1HTN	9,870	105	47	7	A
N1CEV	8,200	82	50	4	A
K1UCA	3,822	49	39	6	A
W1SR	2,500	50	25	2	A
N1AU	74,314	509	73	16	B
NZ1Q	41,138	307	67	7	B
K1AJ	21,460	185	58	2	B
K1VV	8,034	103	39	2	B

W1HP (K1s,KP,OA,KE1BG,N1s,BB, OEK,ops)
204,828 1313 78 24 B

K1TH (+net)
59,736 393 76 10 B

N1RR (+K9NW)
34,840 260 67 5 B

W1AF (KO1O,KC5DJM,N1s EXQ,XDB, ops) 27,136 212 64 24 A

WT1O (+KA1ZAK,KV1X,N1KRT)
24,190 205 59 24 A

AE1M (+net)
23,088 148 78 14 B

W1BP (+W1BJ)
9,000 100 45 12 A

K9NW/1 (+N1RR)
5,400 75 36 2 B

Maine

KD1O	37,752	286	66	24	A
W1LEE	28,544	223	64	19	A
N1MHB	10,648	121	44	10	A
N1LGN	7,600	100	38	4	A
K1JB	30,820	230	67	6	B

K1RQ (+KB1W,NJ1F)
230,880 1480 78 24 B

KS9Z/1 (+net)
58,812 377 78 12 B

W1EJ (+N1s JRO,KHU,YAP,XMQ, NQ1L,WA1ERJ)
37,940 271 70 24 A

New Hampshire

KT1H	15,748	127	62	9	Q
WA1S	74,460	510	73	9	A
WB1GEX	41,172	282	73	19	A
W1SZ	30,192	204	74	24	A

K1CX (KC1F,op)
196,716 1261 78 14 B

K1HI	155,694	1011	77	20	B
K1OZ (at K1RX)	8,282	101	41	4	B

WA1LJD (+WA1LNP)
141,804 909 78 22 B

WS1U (+net)
19,032 122 78 10 A

Rhode Island

KD1IA	10,200	102	50	24	Q
K1VSJ	50,544	324	78	15	A
AA1PQ	10,848	113	48	24	A
WA1HYN	10,800	108	50	4	A
K1DS	9,072	108	42	5	A
K1AM	171,288	1098	78	24	B
K1SD	107,646	699	77	18	B

W1OP (K1PLX,op)
75,600 504 75 17 B

K1MO	31,108	202	77	11	B
KA1WIU	14,410	131	55	11	B

K1NG (+K1SD,KI1G)
240,396 1541 78 24 B

AA1II (+N1QVJ)
21,666 157 69 20 A

Vermont

WA1GUV	5,700	75	38	7	Q
N1RJF	55,728	387	72	24	A
W1SA	28,680	239	60	7	A

N1MR (KB1BMO, op)
24,552 198 62 23 A

WA1ITZ 9,324 111 42 6 A

WB1GQR (W1SJ,op)
250,068 1603 78 24 B

W1US (+K1LOM)
111,264 732 76 20 B

WX1O (+WE3Z)
56,160 360 78 21 A

Western Massachusetts

KZ1M	171,444	1099	78	24	A
K5ZD	77,818	533	73	8	B

W1YK (KA1s WIG,YTR,N1s TLE,RRS, WHI,N3VUN,W1NT,ops)
139,152 892 78 24 B

K1TTT (+net)
42,504 276 77 7 B

2

Eastern New York

KD2IX	6,240	78	40	24	Q
W2EQ	119,016	783	76	24	A
K2UF	87,360	560	78	23	A
WB2LBF	55,950	373	75	24	A
WD2K	28,000	200	70	21	A
KF2SC	22,110	165	67	21	A
K2GS	21,700	175	62	4	A
K2RI	19,032	156	61	10	A
K2IK	14,336	128	56	10	A
KF2WA	13,520	130	52	14	A
N2MTG	12,328	134	46	13	A
KA2HLB	11,904	124	48	11	A
N2CJJ	11,236	106	53	9	A
KG2GP	10,976	112	49	8	A
KB2SSZ	8,554	91	47	11	A
K2YR	6,750	75	45	4	A
WB2TCV	1,482	39	19	3	A
W2XM	1,008	28	18	3	A
KF2LW	123,864	794	78	24	B
N1CC	82,680	530	78	12	B
W2DGJ	72,960	480	76	17	B
WA1KKM	70,004	473	74	15	B
KD2NE	68,838	447	77	18	B
K2ONP	17,100	150	57	3	B
KM6UH	14,896	133	56	11	B

KY2J (+KA2TIP,NA2N)
220,584 1414 78 24 B

WA2UKP (+AA2GS,WA2JQK)
196,716 1261 78 24 B

W2RE (+KB2s HZI,SFU,N2VAH, WA2AWG)
196,248 1258 78 24 B

N2GQS (+net)
98,280 630 78 23 B

KB2HUN (+ops)
96,408 618 78 14 B

N2POS (+N2s PEN,QIP)
46,718 329 71 24 B

N2MFZ (+net)
45,150 301 75 18 A

WB2KDD (+net)
34,200 228 75 10 B

W2WC (+net)
22,776 146 78 24 A

KB2KDY (+KB2s JZJ,SRC)
22,750 175 65 19 A

KB2USV (K2s PC,POF,ops)
7,622 103 37 24 A

Northern New Jersey

KF2HC	8,140	110	37	8	Q
WA2ASQ	4,050	75	27	6	Q
K5KG	87,096	573	76	22	A
K2WA	43,260	309	70	21	A
WB2RQX	31,668	203	78	24	A
N2ULW	21,452	173	62	24	A
N3RB	12,000	125	48	10	A
W2YWC	11,130	105	53	6	A
N2NYR	11,000	110	50	5	A
K2BOG	10,920	105	52	7	A
N2ELW	9,360	104	45	9	A
N2XSE	7,134	87	41	8	A
WA2FVL	3,400	50	34	24	A
W2LRO	1,886	41	23	2	A
WB2K	280,332	1797	78	24	B
WA2UDT	48,180	330	73	7	B
NN2T	31,200	200	78	24	B
W2HCA	21,248	166	64	8	B
N2BIM	12,168	78	78	8	B

KB2POP (+net)
124,800 800 78 15 A

K2KJM (+net)
56,240 370 76 13 A

N2KJM (+net)
56,240 370 76 13 A

AJ2U (+N2KJM)
56,004 359 78 20 B

N2CFD (+net)
39,156 251 78 24 B

W2YR (+net)
38,688 248 78 19 A

KB2UDZ (+KB2SYD,KC2ADW,N2KPB)
36,750 245 75 22 A

N2TTT (+N2NHN)
35,624 244 73 23 A

NN2V (+NO2X)
29,172 187 78 13 B

WA2ZGO (+net)
28,860 185 78 10 A

W2KD (+net)
20,592 132 78 11 B

KZ2A (+net)
15,132 97 78 15 A

K2MFF (KF2TN,N2SMS,ops)
9,030 105 43 15 Q

Northern New York

WZ2T	25,172	203	62	15	Q
N2TNW	16,240	145	56	11	A
WB2BAU	2,600	50	26	4	A
W2ZZ	44,756	334	67	12	B
WB2KLD	18,894	141	67	24	B
N2MD	1,092	26	21	2	B

K2NNY (+KA2IYB,N2PEB,ops)
74,724 479 78 24 A

WN2R (+net)
10,200 102 50 7 A

NYC–Long Island

KD2TT	50,100	334	75	16	Q
AA2VK	13,056	136	48	19	Q
N2KPY	11,016	108	51	9	Q
W2HLI	300	15	10	1	Q
KS2G	57,600	400	72	13	A
WB2AYQ	29,346	201	73	19	A
WA2CNV	26,928	204	66	15	A
W2BZH	24,522	183	67	13	A
KA2D	20,480	160	64	9	A
N2PAE	11,400	114	50	15	A
N2KYP	9,460	110	43	7	A
N2TO	8,976	102	44	8	A
WB2ZTH	6,762	69	49	18	A
K2HVN	2,756	53	26	2	A
W2TNI	2,300	50	23	24	A
K2AU	42,000	280	75	13	B

WA2SYN (+WM2V)
158,808 1018 78 22 B

AD2S (+KA2UYI)
74,000 500 74 14 B

N2JIX (+KF2ER)
40,896 288 71 19 A

K2QMF (+net)
22,946 149 77 10 B

N2LSK (+KA2GWM)
22,784 178 64 13 A

K2DL (+KB2YDV)
10,080 105 48 7 A

W2CXN (+N2RQ)
3,074 53 29 4 A

Southern New Jersey

W2CE	32,412	219	74	11	Q
N2TA	42,742	301	71	11	A
W2ORA	26,664	202	66	12	A
KB2MMI	19,886	163	61	24	A
W5KI	18,270	145	63	7	A
WA2CVJ	18,056	148	61	10	A
KR2G	17,024	152	56	13	A
KF2YX	16,218	153	53	10	A
N2OO	14,100	150	47	4	A
KF2BQ	13,500	125	54	4	A
W2FGY	3,596	58	31	5	A
KA2YKN	2,484	46	27	6	A
AD3Y	1,800	30	30	2	A
N2QWR/T	272	17	8	5	A
AB2E	226,200	1450	78	24	B
N2MM	56,000	400	70	5	B
W2RF	23,288	164	71	4	B
WA2TVS	6,068	74	41	24	B

W2YC (+net)
42,778 293 73 12 B

KD2KS (+ops)
38,184 258 74 14 B

W2BE (+net)
37,668 258 73 14 B

W2TV (+net)
33,540 215 78 10 A

Western New York

WB2VUO	18,544	152	61	15	Q
K2FR	15,960	140	57	5	Q
KB2NU	10,000	100	50	5	Q
W2TZ	113,344	736	77	14	A
NA2Q	67,932	459	74	14	A
WB2WPM	47,268	303	78	24	A
KG2AU	45,880	310	74	24	A
AE2T	42,090	305	69	24	A
KC1ZN	29,118	211	69	24	A
W2KA	26,334	209	63	6	A
W2IMO	23,100	175	66	10	A
N2RMZ	20,096	157	64	10	A
KE2UV	18,408	118	78	10	A
WF2V	17,554	131	67	8	A
N2LQQ	17,442	153	57	13	A
KF2EY	13,104	126	52	12	A
W2OP	11,858	121	49	10	A
WB2JMX	11,628	114	51	10	A
WS2U	11,424	112	51	8	A
WD2F	11,270	115	49	15	A
KF2VX	11,186	119	47	17	A
KN2Q	8,256	96	43	4	A
NA2X	2,464	44	28	1	A
N2XPP	442	17	13	3	A
W6XR	203,580	1305	78	15	B
K8FC	158,652	1017	78	23	B
W2FU	98,592	632	78	10	B
AA2IX	91,050	607	75	24	B
AJ3K	89,474	581	77	12	B
K2WN	38,304	252	76	19	B
W2EZ	30,814	217	71	16	B
W2OMV	30,096	228	66	15	B
NA2A	27,720	210	66	8	B
WR2V	26,784	216	62	16	B
KG2BW	19,824	168	59	12	B
AA2LW	11,210	95	59	5	B

W2RA (+K2RDT,KB2ZFE,W0VU, WA2s IRC,KAE)
106,704 684 78 24 B

AF2K (+net)
78,156 501 78 19 B

KB2UJG (AB2AA,K2DN,KA1EIX, KB2s AED,FAF,HSX,LUV,N2s MRE, ZPT,WB2OSM,ops)
50,100 334 75 24 B

AA2MU (+ops)
49,452 317 78 21 B

NG2P (+net)
46,800 300 78 14 B

WA2ISC (+K2BJ,KB2SWB,N2OMY)
42,700 305 70 17 A

W2RW (+WB2KAO)
40,950 325 63 8 B

K2MP (+net)
31,356 201 78 9 B

AA2XP (+N2UIO)
28,944 216 67 24 A

W2SEX (AA2s OT,YW,KA2WCM, KB2s SCN,URI,UZM,ZHR,N2s RZW, WUU,W2OP,WA2WZX,ops)
27,832 196 71 14 A

KV2W (+KG2BW)
11,152 136 41 15 A

3

Delaware

W3DA	60,952	401	76	12	A
NY3C	12,008	158	38	5	A
N9GG	10,622	113	47	5	A
N3MTU	5,688	79	36	8	A

W3TT (NY3C,op)
46,760 334 70 7 B

Eastern Pennsylvania

N3IGA	23,048	172	67	12	Q
K2LNS	74,022	507	73	20	A
WA3KWU	66,640	476	70	18	A
K3PP	60,528	388	78	18	A
K3AN	51,546	363	71	12	A
NY3Y	47,268	303	78	10	A
KE3MX	38,458	287	67	10	A
N3RM	31,200	200	78	11	A
KB3AGZ	28,050	187	75	14	A
W3DZH	28,000	200	70	12	A
K3SV	27,600	200	69	24	A
WB3AAK	26,660	215	62	15	A
WB3AAL	16,800	140	60	5	A
N3TA	16,060	146	55	11	A
N3RN	14,750	125	59	4	A
N3TKK	14,400	144	50	10	A
WB3IZF	13,600	136	50	12	A
W3RJ	11,514	101	57	24	A
KA3TUG	11,232	108	52	10	A
WA3HGW	9,976	116	43	6	A
N3LBC	9,660	105	46	5	A
KE3OA	9,360	104	45	6	A
N3SIN	7,070	101	35	6	A
N3KKM	5,688	79	36	4	A
AG3G	5,472	72	38	11	A
W3RT	3,162	51	31	5	A
W3EFY	1,152	32	18	1	A
W8IJ	8	2	2	1	A
WB3FAA	134,472	862	78	19	B
NE3F	101,400	676	75	24	B
WB3EMG	78,128	514	76	20	B
K3AR	72,852	467	78	14	B
WT3H	10,810	115	47	3	B

WY3T (+KA3PVA,N3KGL,WR3H)
142,296 924 77 24 B

NK8Q (+KA2BIQ,N2FAM,ops)
62,244 399 78 22 B

AA3JU (+net)
48,488 319 76 9 B

K3WW (+net)
39,936 256 78 8 B

NE3H (+net)
39,672 261 76 6 B

N3FSC (+net)
13,208 127 52 9 A

Maryland-DC

W2EOS	20,904	156	67	12	Q
K1RA	174,096	1116	78	24	A
N5OKR/3	120,900	775	78	24	A
W3KN	100,100	650	77	22	A
N3UN	59,280	380	78	18	A
W3GHR	43,310	305	71	15	A
K3SA	36,540	261	70	5	A
KA3TGY	27,300	195	70	16	A
N3HUV	25,620	210	61	13	A
K3HH	21,120	160	66	7	A
WD3A	18,560	145	64	8	A
N3NT	17,856	144	62	16	A
W3EE	17,696	158	56	11	A
N3MNT	17,632	152	58	7	A
WA3YSW	16,240	145	56	8	A
W3CP	16,008	138	58	10	A
NV3V	12,936	132	49	24	A
AA3NB	9,870	105	47	24	A
WB2DNE	8,610	105	41	24	A
W3AZ	6,888	82	42	6	A
WA3WJD	5,846	79	37	4	A
K3MM	256,308	1643	78	24	B
K3ZO	171,094	1111	77	13	B
W3HVQ	106,392	682	78	20	B
K0DEQ	80,700	538	75	10	B
W9VL	75,184	508	74	13	B
N3II	62,400	400	78	24	B
K3IXD	39,576	291	68	11	B

KE3Q (+net)
254,592 1632 78 21 B

W3HR (+net)
117,000 750 78 18 B

K3DI (+WD4IEH)
113,036 734 77 24 B

N3RR (+N3KTV)
106,860 685 78 21 B

ND3F (+N3s OPM,SLN)
103,642 673 77 18 B

W3EAX (+NF3I,N3NKI)
84,150 561 75 24 A

K3KY (+net)
42,560 280 76 24 B

KB3BLK (KA8YPY,KD3ZS,N3s LDY, LFL,MJA,TZA,W3s DAD,LM,YD, WI3N,WV3D,ops)
27,792 193 72 15 B

KA3TCC (+N3VBG)
13,888 124 56 13 A

W3UR (+net) 896 32 14 1 A

Western Pennsylvania

KA1NDY	3,584	56	32	24	Q
WA3HAE	115,284	739	78	24	A
AD8J	111,540	715	78	19	A
WA3SES	109,032	708	77	23	A
N3IXR	87,780	570	77	22	A
AA3CE	40,950	273	75	19	A
W3TWI	40,150	275	73	21	A
NI3I	27,612	177	78	9	A
KD3VX	21,774	191	57	13	A

W3KWH (K3RYA,op)
11,340 135 42 3 A

KA3UOL	10,406	121	43	10	A
WA3RBK	9,064	103	44	12	A
KC3LV	3,536	52	34	5	A
K3UA	15,072	157	48	2	B

W3GH (+W9XR)
319,176 2046 78 24 B

K3CR (KB3AFT,N3OET,NW3Z, WA3FET,ops)
261,612 1677 78 24 B

K3MD (+N3PUR)
178,932 1147 78 24 B

W3IQ (+KA3SMF,KE3ED,N3s AZZ, OJL) 50,544 324 78 24 B

WW3S (+net)
45,240 290 78 15 A

KE3XS (+KB3A,KE3XZ)
7,920 110 36 24 A

4

Alabama

KR4QI	30,940	238	65	12	A
K2RUE	29,736	252	59	24	A
K1BS	10,094	103	49	5	A
K4AB	282,828	1813	78	24	B
K4JYO	158,808	1018	78	19	B
K4NO	109,648	712	77	13	B
W4NTI	66,272	436	76	24	B
K4NA	26,928	204	66	6	B

KX4M (KA2DRH,N4YO,ops)
199,368 1278 78 24 B

W4RJ (+K4ZGB)
165,672 1062 78 19 B

AE4WP (+KE4RLL)
43,920 305 72 19 B

AD4DA (+AD4DB,KD4WAC,KE4s BEE, FRZ,HBB,HJQ,KF4s HBA,HFF)
30,150 201 75 24 B

K4RY (KE4s TNK,USO,KR4Y,ops)
13,230 135 49 24 A

Georgia

KD3GC	112,650	751	75	19	A
K4BAI	62,308	421	74	16	A
AA4LR	61,716	417	74	16	A
K4OGG	57,888	402	72	24	A
K3TD	39,600	264	75	15	A
N4NFI	32,706	237	69	17	A
KT4NT	31,666	223	71	13	A
KT4WM	14,960	136	55	17	A
N4IBO	11,970	105	57	7	A
KB4GID	54,756	351	78	9	B
N4XQN	44,304	284	78	17	B
W5SS	33,384	214	78	11	B
WB5RYB	14,190	129	55	7	B

W4WA (+AA4GA,N9HZQ)
303,108 1943 78 24 B

W4AQL (KC5PPV,KE4s IWN,TFV, N2NSZ,N4CXF,N7FYT,W4RU, WA4KXY,ops)
128,388 823 78 23 B

W4PYM (+KC4GCK,KE4IXE)
35,840 256 70 13 A

AE4XO (+KE4WIO)
25,568 188 68 10 A

Kentucky

KD4LHA	97,800	652	75	17	A
N4UL	80,100	534	75	20	A
KB4SRE	64,676	437	74	21	A
WA4VOC	60,800	400	76	21	A
AC4PY	52,096	352	74	24	A
AE4GH	45,406	311	73	20	A
KQ4MG	44,304	312	71	13	A
KM4FD	21,000	150	70	13	A
KQ4JQ	15,400	154	50	11	A
KF8VS	13,824	128	54	9	A
K4AT	13,158	129	51	6	A
KC4DWT	89,376	588	76	18	B
AE4RG	58,058	377	77	20	B
AE4EY	57,600	400	72	16	B
N4XM	11,024	104	53	4	B

W4CN (K4AT,KI4DC,KT4GC, NK4P,ops)
145.080 930 78 24 B

WD8JAW (+KC4ZSV,KC8CWK, KE4HQB)
11,440 110 52 24 A

North Carolina

KT4LD	39,936	256	78	13	Q
WA4ZXA	191,568	1228	78	22	A
N2NFG	117,450	783	75	20	A
KS4XG	77,816	548	71	24	A
KQ4AV	63,336	406	78	24	A
KO4MM	59,598	387	77	21	A
KS4RP	52,736	412	64	24	A
K4RZ	52,728	338	78	24	A
KZ2I	47,652	361	66	12	A
KA4IKH	40,170	309	65	12	A
WB4VIM	26,412	213	62	22	A
KE4JZY	21,868	154	71	20	A
N9TMU	20,292	178	57	21	A
W2VMX	11,322	111	51	7	A
N4UOH	9,492	113	42	24	A
AF4D	9,248	68	68	10	A
W4LN	7,208	106	34	9	A
KS4S	6,936	102	34	12	A
KT4OC	4,554	69	33	24	A
W4YE	3,132	54	29	2	A
K4ZA	259,428	1663	78	24	B
N4AF	234,156	1501	78	24	B
K4MA	221,988	1423	78	24	B
N4BNO	76,066	521	73	14	B
WF2G	65,660	490	67	9	B
N4CW	62,720	448	70	8	B
AA4S	60,976	412	74	11	B
KC4YM	55,160	394	70	19	B
KE4RHU	11,760	120	49	7	B
W4UW	5,022	81	31	24	B

W4ATC (AA4NC,AD4RC,KD4SKW, KF4s HQT,MOK,KO4PY,N3QYE,ops)
112,728 732 77 24 B

WB8BMV (+net)
104,520 670 78 19 B

AC4ZO (+AD4ZE,KE4s DRJ,FCJ, N4YTO) 65,208 429 76 24 A

W4BFB (KE4LZE,WN4BBJ,WO4G,ops)
39,600 300 66 12 B

KQ4K (+KE4s EUH,RRX,YSB,YSC, PTQ,KF4s LIA,LJV,KR4RR,KS4PX)
30,810 237 65 24 A

KF4HFS (AE4SH,KE4MOY, KF4FUS,ops)
11,336 109 52 24 B

Northern Florida

WB4OMM	99,684	639	78	18	A
AB4KL	50,410	355	71	24	A
N4EEB	44,460	342	65	5	A
WB4ZAY	39,858	273	73	17	A
AC4OC	16,016	143	56	24	A
K2DF	11,130	105	53	24	A
WC4E	10,200	100	51	3	A
N2MJZ	7,568	86	44	12	A
K4VUD	274,092	1757	78	24	B
W4UEA	14,986	127	59	11	B
KA4HHM	9,996	102	49	12	B

AC4QM (+KE4KUH,KO4YX,KS4EL, WD4GDZ)
138,840 890 78 24 A

Puerto Rico

WP4LNY	40,128	304	66	24	A
NP3CC	29,862	237	63	15	A
KP4YB	20,500	205	50	24	B

South Carolina

KS4DU	12,036	102	59	7	Q
W8PC	82,800	552	75	24	A
KB4GYT	76,500	510	75	24	A
K4DB	61,028	418	73	13	A
N2FY	44,100	315	70	19	A
K4ADI	12,376	119	52	5	A
KR4PB	7,740	90	43	7	A
AA3II	4,440	60	37	11	A
N4EE	2	1	1	1	A
N4UK	265,696	1748	76	24	B
KC4MVZ (+KE4s MHO,NNS,YUL)	25,420	205	62	24	B

Southern Florida

KN4T	105,144	674	78	18	A
WD4AHZ	55,500	370	75	18	A
AE4MH	34,320	264	65	18	A
KR4ZA	16,756	142	59	18	A
N4DL	16,588	143	58	9	A
N1RT	14,896	133	56	24	A
W4MK	12,700	127	50	6	A
W3DHN	11,770	107	55	8	A
K7UPJ	11,424	112	51	5	A
WB4BBH	10,608	104	51	6	A
N2EGO	10,504	101	52	10	A
W4EF	8,400	84	50	24	A
WW1N	1,728	32	27	2	A
KD4ZKX/T	16	8	1	6	A
N4BP	202,800	1300	78	19	B
K1FIR	11,024	104	53	5	B

K4OJ (+K1KNQ,KR4YL)
125,424 804 78 20 A

WB2QLP (+KE4RGH)
61,174 419 73 20 B

AD4TR (+net)
44,100 294 75 24 A

Tennessee

WO4O	123,864	794	78	24	A
KE4OAR	59,052	399	74	21	A
WD4K	16,740	135	62	24	A
KE4GYR	13,392	124	54	10	A
KE4TLY	11,368	116	49	7	A
KC4URW	8,400	100	42	8	A
AD4XP	3,640	52	35	4	A
KA4MRR	2,050	41	25	4	A
KA4OTB	35,108	262	67	15	B
W4OGG	10,082	71	71	10	B

N4ZZ (+K0EJ)
292,344 1874 78 24 B

N4CM (+KD4HIK,KQ4HC)
238,524 1529 78 24 B

N4DW (+net)
31,602 229 69 9 A

Virgin Islands

WP2Z (K8MJZ,op)
243,320 1580 77 23 A

KP2N (+NP2s DJ,DZ,IY,WY,WP2s K,X)
125,424 804 78 24 B

Virginia

K4RG	78,936	506	78	23	A
KD4HYT	76,368	516	74	12	A
K4MW	72,352	476	76	11	A
K4PK	60,750	405	75	21	A
KU3M	57,218	427	67	14	A
N4MM	55,068	353	78	19	A
AD4DG	45,750	305	75	17	A
WY2V	43,168	304	71	24	A
W4VG	39,200	280	70	14	A
KT4CB	33,040	236	70	24	A
KC4ZRH	30,100	215	70	24	A
KD4IBI	29,212	218	67	17	A
W4VC	28,290	205	69	11	A
KQ4KK	28,140	201	70	14	A
KS4UW	21,692	187	58	15	A
AA4KD	20,740	170	61	13	A
AE4QS	19,932	151	66	24	A
KO4SO	19,840	155	64	12	A
WB4ZPF	19,458	141	69	12	A
W4RM	16,800	200	42	4	A
K4RDU	15,008	134	56	18	A
KE4UVO	13,130	101	65	10	A
K4FPF	12,750	125	51	24	A
KT4SC	12,696	138	46	10	A
KE4MIL	11,400	114	50	11	A
KK4R	11,280	120	47	8	A
W2MG	10,486	107	49	6	A
KQ4XJ	10,028	109	46	13	A
W4YCZ	9,912	118	42	5	A
W4TMN	9,280	116	40	7	A
WA0DYJ	9,240	105	44	11	A
KS4JB	8,160	102	40	11	A
W4IN	7,350	105	35	4	A
AE4EW	5,244	69	38	5	A
KE4WFO	5,208	62	42	10	A
W6IHG	2,520	42	30	12	A
N3TG	540	18	15	1	A
KO4MR	84	7	6	1	A
W2HD	50	5	5	1	A
W4MYA	255,528	1638	78	24	B
KJ4VG	165,680	1090	76	24	B
AA4EL	103,584	664	78	17	B
K4IQ	93,900	626	75	12	B
N3JT	73,000	500	73	8	B
K4SO	66,924	429	78	11	B
WA4DAI	47,880	342	70	12	B
W2YE	32,982	239	69	10	B
K3SS	31,624	236	67	16	B
W4ZYT	30,284	226	67	6	B
KC4B	27,060	205	66	13	B
W4MPJ	16,500	150	55	16	B
N1MHV	15,400	154	50	24	B
WA4FRH	9,180	102	45	10	B

K1GG (+net)
222,456 1426 78 24 B

KF4AGR (KA4RRU,N8NEV,ops)
189,852 1217 78 24 B

W4DC (+KC4SZT)
187,200 1200 78 24 B

N4SR (+net)
147,264 944 78 22 B

W4NF (+net)
84,084 546 77 15 B

W4DF (+WA4RTS)
70,200 450 78 23 A

K4UK (+KF4LBD)
50,764 343 74 24 A

W4IM (+KC4DCL)
44,488 332 67 18 A

WA4QDM (+net)
36,344 236 77 24 A

N1KC (+net)
29,484 189 78 17 A

5

Arkansas

N5DX	207,792	1332	78	24	A
AB5SE	144,760	940	77	24	A
KK5GT	85,176	546	78	22	A
N3UQE	20,160	144	70	19	A
KK5RR	16,940	154	55	24	A
KG5NE	13,130	101	65	10	A
KK5XF	11,880	110	54	19	A
KA5QOF	10,300	103	50	11	A
KJ5WX	9,000	100	45	9	A
K5YRZ	6,768	72	47	7	A
WV3B/5	23,546	193	61	7	B

W5YM (AH2AK,K5GOE,KC5s EQJ. LDC,TTQ,KK5PO,N5UWY,ops)
145,704 934 78 24 B

N5AT (AB5s LE,TR,KC5s CNO,DCI, NLD,N5XAY,ops)
124,020 795 78 23 B

AB5RQ (+KJ5YK,KD5ZM,NO5W)
106,548 683 78 24 A

Louisiana

NZ5O	100,562	653	77	20	A
N5SMQ	71,700	478	75	24	A
KC5ZZ	53,400	356	75	24	A
N5MYH	44,696	302	74	17	A
N5NA	13,804	119	58	5	A

W5WMU (+KZ5D)
326,664 2094 78 24 B

AE5T (+KS5L,KA5M,KB5ZRD,KC5s FLN, NBC,KJ5SU)
210,444 1349 78 24 B

K5MC (+K5ELM,KK5CF,W5EW, WA5SXU)
100,100 650 77 24 B

W5GAD (KB4OGM,KC5KWZ, N5s OGW,TEK,UXT,VVB,W5s LMR, RMS,WA9TMC,WB9VTN,ops)
78,156 501 78 21 B

KI5EE (+KJ5NS)
26,000 200 65 10 A

Mississippi

N5QDE	56,092	379	74	19	A
KB5FET	26,928	204	66	17	A
KJ5RC	19,008	132	72	16	A
KB5SQX	8,300	83	50	7	A
KB5ZKX/T	24	6	2	3	A
WA5OYU	159,276	1021	78	21	B

N5FG (+KR4QQ,WQ5L)
131,976 846 78 24 A

N5KKG (+AC5BN,KB5s IXI, RQL, VLA, KC5KPP)
66,300 425 78 16 A

New Mexico

W5IV	34,018	233	73	19	A
KJ5EY	23,436	186	63	11	A

K7UP (W5FX,op)
283,206 1839 77 24 B

K2EI	282,048	1808	78	24	B
K5AM	173,316	1111	78	14	B
KB6SS	53,400	356	75	19	B
WB5TGL	28,424	209	68	18	B

K9RS (+AA5B,K5TA,AI9X)
355,524 2279 78 24 B

N5AV (+KN5H)
38,736 269 72 10 B

KC5KKY (+KC5KKX)
15,950 145 55 11 A

North Texas

K5OT	55,328	364	76	20	Q
W0CO	42,624	288	74	21	Q
K3ETS	37,444	253	74	20	Q
NA5S (KE5CV,op)	221,052	1417	78	24	A
WD5K	165,048	1058	78	24	A
NT5V	100,152	642	78	13	A
NY5B	96,720	620	78	20	A
NN5T	91,572	587	78	21	A
W5MYA	88,038	603	73	10	A
WK5K	43,946	301	73	24	A
N5WD	37,200	248	75	18	A
N5MTS	36,400	260	70	12	A
AB5C	28,392	182	78	12	A
W5ST	24,420	165	74	14	A
W5WB	22,464	156	72	15	A
K5BL	19,272	146	66	14	A
NE0P	5,056	79	32	7	A
KB5KTY	4,200	60	35	4	A
KC5OZT	442	17	13	8	A
K5RX	309,192	1982	78	24	B
K5ZO	204,828	1313	78	23	B
N5KM	204,672	1312	78	21	B
W5PLN	115,500	750	77	24	B
W5FO	110,760	710	78	14	B
AC5CT	102,054	699	73	22	B
W3UA	50,410	355	71	24	B
K5LP	34,500	250	69	12	B
K6AZA/5	21,576	186	58	24	B

K5MR (+W5WW)
268,320 1720 78 24 B

N5TJ (+net)
66,768 428 78 24 A

KB5YIA (+KC5QLQ)
37,000 250 74 22 A

KC5OJY (KC5CGH,KB2RVB,KK5KN, N5VHO,ops)
29,376 216 68 24 A
N5MUJ (KC5s VPY,VPZ,WUG,WUH, NQ5X,ops)
9,976 116 43 15 A

Oklahoma

K5KA 116,270 755 77 13 A
W5TZN 33,540 215 78 21 A
KC5ASD 29,900 230 65 12 A
KB5ENP 26,390 203 65 15 A
KK5XI 18,904 139 68 22 A
KB5IRL 18,212 157 58 11 A
K5PX 12,838 131 49 5 A
KC5KUG 9,660 105 46 16 A
AA5HV 2,700 45 30 3 A

KB5BOB 94,402 613 77 14 B
AB5I 54,756 351 78 12 B
K5CM 45,640 326 70 10 B
KB5ZUD 41,400 300 69 12 B
K5YAA 24,970 227 55 2 B

NJ5S (+KA7GLA,KA0RNY,KB0GBD, KC5s GUD,TEZ,KM5DH,N1UOC, WB5OQX)
112,420 730 77 24 B
WD0GTY (+WB0ZWW)
51,696 359 72 22 A
KB5RBX (+N5SAM)
37,076 299 62 24 A

South Texas

KG5U 23,660 182 65 7 Q
N5BA 1,320 30 22 2 Q

WA5IYX 64,600 425 76 20 A
WA5TOS 62,900 425 74 17 A
AB5SS 56,502 387 73 16 A
AC5FW 40,752 283 72 20 A
N5XUS 40,470 285 71 13 A
NJ1V 30,096 209 72 10 A
WD5GNI 29,040 220 66 16 A
KK5CA 28,566 207 69 10 A
WA5WZA 25,344 198 64 6 A
K0BCN 24,830 191 65 11 A
K5ZTY 24,708 174 71 8 A
K5WA 18,492 138 67 6 A
N5RLQ 16,500 150 55 15 A
W5PDW 12,880 115 56 2 A
KK5DO 12,528 108 58 24 A
KK5KX 11,466 117 49 8 A
WA5SAJ 10,788 93 58 9 A
WA5DJU 10,682 109 49 18 A
W5VHN 10,600 100 53 24 A
K5WNO 10,404 102 51 24 A
WB9LAU 10,120 110 46 11 A
N5RBC 10,058 107 47 11 A
N5NMX 9,116 106 43 3 A
W5OYH 5,472 72 38 9 A
K5GQ 3,192 57 28 4 A
KM5CF 2,838 43 33 24 A
N8ECG 1,550 31 25 3 A

N5JA 330,564 2119 78 24 B
K5TR (at W5KFT)
319,550 2075 77 24 B
N5KA (at N3BB)
306,228 1963 78 24 B
W5ASP 195,156 1251 78 19 B
K5NZ 142,576 938 76 24 B
AB5EA 138,216 886 78 24 B
K5DX 121,680 780 78 24 B
K5RC 87,672 562 78 8 B
WD5DXL 87,600 600 73 19 B
NA4M 50,516 346 73 24 B
KK5GJ 44,850 325 69 8 B
K8CSG 37,444 253 74 13 B
KB5RUG 31,668 203 78 16 B
W5XD 12,512 136 46 8 B
W5NR 4,800 60 40 4 B

K5DU (+K5NA,WB2Q)
242,112 1552 78 24 B
W5EHM (N1PVB,AA5BT,KA5WSS, KG5KI,ops)
194,688 1248 78 24 B
N5TU (+KC5VHI,KM5DX,W2YX,W5MJ)
156,936 1006 78 24 B
W5NC (K1OJ,K5s NZ,ZTY,KA5AKG, KC5QDX,KJ5X,KK5LD,N5KEU, WA5s DWX,MLJ,SAJ,ops)
156,000 1000 78 21 B
W5OO (+K5MV,KC5WCN,N5AF)
109,356 701 78 15 B
KK5MH (+KC5NRA)
54,040 386 70 22 B
KI5ME (+net)
29,252 206 71 19 A
KB5ZXO (+KC5UTN)
1,632 34 24 3 A

West Texas

K5ED 85,500 570 75 18 Q
AB5WB 45,440 320 71 14 Q

WB5M 101,384 667 76 16 A
KB5LMB 10,800 120 45 21 A

WB5AAR (N5RZ,op)
257,244 1649 78 18 B

KJ5BX (+KB5KYJ,KC5s HNI,KQF,MVT, OBX,QZM)
93,940 610 77 24 B

6

East Bay

K6XV 57,912 381 76 24 A
K6AOM 24,180 186 65 22 A
AC6DR 18,848 152 62 18 A
W8UT 11,000 110 50 5 A
WB6DSV 5,476 74 37 2 A

N6VV 171,600 1100 78 12 B

W6BSY 156,312 1002 78 20 B
W6RJ 67,080 430 78 6 B
K6ZM (AC6CI,op)
66,640 490 68 8 B
WW6I 22,560 188 60 24 B
N6ZM (NH7A,op)
3,286 53 31 24 B

W6DI (N6UUG,WX6M, ops)
209,820 1345 78 24 B

Los Angeles

K6RO 170,352 1092 78 24 A
KC6X 139,620 895 78 22 A
W6KC 85,932 558 77 20 A
WA7BNM 82,368 528 78 13 A
WB6NFO 71,568 504 71 18 A
KQ6ES 48,240 335 72 24 A
W6LX 38,304 266 72 19 A
N6TW 31,720 244 65 24 A
WE6E 26,460 210 63 14 A
NA2D 24,156 198 61 13 A
N7KFL 21,204 186 57 13 A
NM6X 20,174 131 77 17 A
KE6VWV 19,040 170 56 24 A
WB6CGZ 18,126 159 57 22 A
KE6JLF 3,000 50 30 7 A
KN6DQ 504 18 14 24 A

K6LA 262,080 1680 78 24 B
KØDI 164,780 1070 77 24 B

W6UE (KA6SAR,KF6EHD,N7UE, N9YS,ops)
245,856 1576 78 23 B
K6VR (+net)
25,102 163 77 14 A
KE6WEH (KD6s NMR,QWU,ZHU, KE6s GHX,RJE,ZTK,KF6s DFI,GMG, GYY,N6s WZR,XAC,ops)
23,684 191 62 23 B
W6VPZ (KC6TWP,N6YPJ,ops)
4,248 59 36 6 A

Orange

KC6CNV 145,160 955 76 24 A
WM7D 28,116 213 66 24 A
WA6JZQ 19,936 178 56 23 A
KO6XB 14,080 128 55 10 A
K6BVE 13,920 120 58 13 A
W6NT 12,500 125 50 13 A
WA6GFR 7,392 88 42 7 A
N6RT 6,900 75 46 4 A

N6HC 218,400 1400 78 23 B
W6TKV 88,920 585 76 15 B
K6NR 18,232 172 53 5 B
W6HT 9,374 109 43 7 B

W6EEN (+K6XC)
197,184 1264 78 17 B
K6HRT (+N6s XSS,YZT)
180,492 1157 78 23 B
KM6HB (+ops)
80,234 521 77 19 B
KE6SWV (K6TOS,KE6WUE,W6KAT, WA6SNG,WB6JBL,ops)
52,414 359 73 24 A
W6JBT (+KE6LTT,KF6CR,N6CMF, W6HAL,)
25,956 206 63 14 A
AC6YB (+AC6XK,KE6NIB)
14,098 133 53 11 A
K6RUB (+WB6BMR)
13,340 115 58 7 A

Pacific

WB6FZH/KH6
4,760 68 35 24 Q

WH6DY 71,208 516 69 13 A

KH6FKG 108,770 745 73 23 B

Sacramento Valley

W6PYX 148,512 952 78 24 A
KE6QNJ 57,936 408 71 21 A
KD6WP 20,276 137 74 11 A
KO6IS 16,790 115 73 9 A
W6QEU 12,168 78 78 15 A
KO6RU 9,996 102 49 24 A

KG6LF 257,244 1649 78 24 B
K6PU 136,032 872 78 13 B
AC6DQ 126,048 808 78 15 B
KD6RHM 40,016 328 61 13 B
W6REC 12,878 137 47 2 B

K6RCC (AA6WJ,N6IG,NB6G,ops)
323,388 2073 78 24 B
N6ZS (+N6SNO)
220,740 1415 78 24 B
KV6H (+net)
206,076 1321 78 23 B
AI6V (+KQ6IT)
196,992 1296 76 16 B
N6KE (+K6GV,KJ6YC,KN6OX)
180,336 1156 78 24 B
K6SG (+K3EST)
146,016 936 78 19 B
KQ6IT (+ops)
67,800 452 75 13 B
W6YM (+KE6FEE)
34,160 244 70 13 B
K6JJ (+net)
21,248 166 64 17 A

San Diego

W6CN 35,520 240 74 23 Q

N6SMW 25,012 169 74 24 A
W6MVW 13,920 120 58 24 A
K6CT 10,200 100 51 24 A
K6VWL 10,152 108 47 20 A

W6JVA 72,540 465 78 12 B

WA6YOO 36,816 354 52 8 B
WA6UFY 24,240 202 60 7 B
KD6QK 19,440 162 60 5 B

N6KI (+K6AM,KC6WEO,KM6WF, N6UWW,WB6NBU)
265,512 1702 78 24 B
KC6VVT (+KC6ZEC,N2LWL)
39,150 261 75 24 A

San Francisco

K6UM 76,152 501 76 16 A
N6ZFO 69,412 469 74 16 A
W6ESJ 50,768 334 76 18 A
AC6AH 12,528 116 54 8 A
WA6QCL 12,480 120 52 7 A
K6LRN 3,712 58 32 24 A
W6BD 40 5 4 1 A

WB2CHO 28,896 258 56 24 B
WA6CTA 5,780 85 34 2 B

W6PW (KD6s VWD,YDY,KN6SY, KO6GF,N6BWS,NN6D,W6s BD, VV,ops)
45,752 301 76 24 A
KE6SLS (+KF6AAR)
35,904 272 66 18 A

San Joaquin Valley

K6MI 4,104 57 36 4 Q

KG6OB 32,982 239 69 17 A
KO6RW 24,656 184 67 14 A
KI6PG 15,048 132 57 17 A
W6DPD 13,250 125 53 9 A
KE6JTH 12,882 113 57 16 A
W6WM 12,192 127 48 24 A
KE6GTR 10,192 104 49 24 A
W6UOX 9,720 108 45 12 A

WC6H 292,138 1897 77 24 B
WA6YEE 37,240 245 76 15 B
WB6QVI 11,220 110 51 7 B

N6MU (+N6MI)
204,204 1326 77 24 B
KT6RA (+KD6KKP)
171,132 1097 78 24 B
NT6K (+KA6BIM)
138,840 890 78 24 B
WB6YIK (+KC6HJJ)
109,032 708 77 22 B
N6TNX (+N6TNW)
100,320 660 76 19 B
W6XK (+NR6N,W6PS)
94,240 620 76 20 B
KM6AE (+AC6WP,K6ALE,KE6TII, KK6KE) 27,090 215 63 17 A
N6EE (+NET)
18,560 145 64 6 A

Santa Barbara

WA6FGV 91,260 585 78 19 A
W6GL 58,064 382 76 21 A
W6BKY 16,530 145 57 11 A
W3KT 10,700 107 50 8 A
W6HYK 9,916 74 67 12 A
N6PMO 8,118 99 41 11 A
KE6UUP 4,736 74 32 11 A
KC6GRY 120 10 6 2 A

W6NK 154,752 992 78 19 B
W6TKF 138,684 889 78 16 B
KO6NE 1,450 29 25 24 B

W6BHZ (KC6WOT,KD6CVS,KE6SYA, N6s DE, ED,ops)
137,060 890 77 24 B

Santa Clara Valley

N6NF 141,834 921 77 17 A
AD6E 92,862 603 77 19 A
AE6Y 81,774 531 77 11 A
N6ZB 55,008 382 72 16 A
W6PLJ 31,944 242 66 21 A
K6EP 31,920 228 70 24 A
K7JJ 29,882 223 67 10 A
KE6EFO 23,058 183 63 14 A
AC6UR 9,632 112 43 24 A
N6NM 3,360 56 30 2 A
W6/XE1RGL 2,400 48 25 12 A
N2ALE 32 4 4 1 A

N6NT 258,960 1660 78 24 B
N6TV 191,412 1227 78 16 B
K6HNZ 159,276 1021 78 21 B
NI6T 154,596 991 78 24 B
K6GT 104,192 704 74 21 B
W6ISO 99,684 639 78 21 B
N7TN 89,528 589 76 7 B
K6XX 42,772 289 74 24 B
K6KR 36,864 288 64 4 B
K6III 35,500 250 71 14 B
W6CF 7,918 107 37 2 B

W6OAT (+net)
156,936 1006 78 15 B
AB6EQ (+KD6NOS)
113,344 736 77 24 B
AEØM (+NØBBS)
63,024 404 78 18 B
N6SF (+net)
18,648 126 74 16 B
KE6CCJ (+KF6BKK)
11,092 118 47 10 A

7

Alaska

KL7WP 48,024 348 69 13 A

AL3/N7DF 67,800 452 75 10 B
NL7RK 47,616 384 62 9 B
WL7E 17,400 174 50 5 B

Arizona

AA7VY 52,052 338 77 24 Q
N7JXS 26,532 201 66 19 Q

W7ZMD 89,072 586 76 16 A
NF7E 63,504 504 63 18 A
KD4HXT 44,588 314 71 18 A
KK6IF 34,704 241 72 24 A
W7YS 25,200 200 63 11 A
W7ZT 20,930 161 65 14 A
W7EYG 15,480 129 60 18 A
KJ7BS 13,000 125 52 19 A
K6ZCL 11,270 115 49 8 A
KA7AKJ 11,074 113 49 9 A
KJ7OF 10,152 108 47 10 A
N7WAQ 9,116 106 43 12 A
KJ7JT 3,990 57 35 10 A
KI7LS 2,240 40 28 5 A
W6SYM 1,440 30 24 2 A
KB7WQV 140 10 7 1 A

K6LL 338,364 2169 78 24 B
WAØKDS 122,360 805 76 20 B
W7WW 121,296 798 76 24 B
K6TIM 30,816 214 72 10 B
NQ7X 13,888 124 56 11 A

N7LR (+KC7FWM,W9CF)
45,360 324 70 22 B
KB7TLE (+KB7YHT)
11,270 115 49 6 A

Eastern Washington

K7MM 62,928 437 72 23 Q

K7FR 225,888 1448 78 24 A
WS7V 60,496 398 76 24 A
K7IOO 51,830 355 73 14 A
W7WMO 16,356 141 58 5 A
W7OVJ 15,288 147 52 14 A
KG7YU 11,662 119 49 24 A

K7IR (+K7XS,N7CID)
254,592 1632 78 24 B
W3AS (+ops)
120,744 774 78 18 B

Idaho

W7ZRC 215,748 1383 78 24 A
KK7A 87,600 584 75 9 A
K7ZO 54,908 371 74 15 A
W7II 47,286 333 71 24 A
K7NHA 34,776 252 69 9 A
KE7RT 18,290 155 59 12 A
KJ7FE 17,664 138 64 16 A
WB7CYO 15,660 135 58 8 A
WB7ECB 12,544 112 56 24 A

KJ7TH 41,964 269 78 24 B
AA7UN 16,536 106 78 14 B
WAØDYU 14,508 117 62 24 B

W7UQ (KB7LFO,KI7RO,ops)
73,852 499 74 23 A
N7NQO (+KC7NAV,KI7KF)
29,664 206 72 24 A

Montana

K7BG 66,600 444 75 11 A

N9ITX/7 236,028 1513 78 24 B
KS7T 133,380 855 78 19 B
KJ7VP 76,440 490 78 16 B

W7FO (AA7LU,AB7CE,WA7FBJ,ops)
26,004 197 66 13 A

Nevada

NC7K 82,212 527 78 12 A

N7TR 354,276 2271 78 24 B
W6IXP/7 60,620 433 70 21 B

AAØCY (+net)
15,568 139 56 6 B

Oregon

W7YAQ 104,720 680 77 24 Q
K7RAT (N6TR,op)
34,272 252 68 24 Q

AA7KF 56,942 401 71 7 A
KI7Y 32,830 245 67 12 A
KU7K 29,252 206 71 11 A
KR7X 25,216 197 64 24 A
K7VIT 19,116 162 59 10 A
AB7NV 10,080 105 48 8 A
K7NT 8,200 100 41 24 A

AI7W 222,612 1427 78 22 B
KA7ZUM 168,872 1111 76 24 B
K7GWK 65,360 430 76 20 B

W7GG (+KH8AL,N2WEW)
282,828 1813 78 24 B
KE7CR (+KA7MZZ)
40,260 305 66 15 A
WA7IIM (+KC7HSZ)
22,302 189 59 11 A

Utah

KB7SLK 5,382 69 39 8 Q

K7CF 168,636 1081 78 24 A
W7HS 17,464 148 59 15 A
KC7CNA 12,246 157 39 24 A

KO7X (KI7WX,op)
210,756 1351 78 24 B
AF7O 61,600 400 77 24 B
NG7M 51,888 376 69 24 B
K8EI 29,078 217 67 8 B
KJ7TO 896 28 16 24 B

KI7ST (+KC7RAI)
14,960 136 55 24 A

WB2UFO (+KB9BAL)
14,580 135 54 24 B

Western Washington

N7DM 6,480 81 40 6 Q

K7QQ 225,264 1444 78 24 A
K9JF 110,136 706 78 12 A
N7ETC 82,460 589 70 18 A
W7QN 69,058 473 73 14 A
K7CW 67,860 435 78 18 A
K7LXC 46,512 342 68 10 A
AB7PX 37,296 259 72 22 A
N7OYR 35,500 250 71 22 A
AA7VT 34,362 249 69 18 A
KY7K 33,750 225 75 20 A
AB7RW 30,774 223 69 18 A
KA7KUZ 28,980 230 63 12 A
KN7T 25,350 195 65 24 A
W7LRD 24,192 216 56 16 A
W7DON 20,800 160 65 24 A
KE7SW 20,590 145 71 24 A
N7AME 19,604 169 58 24 A
K7GDN 15,738 129 61 12 A
WA7UVJ (N7WA,op)
11,374 121 47 24 A
N7OZN 11,270 115 49 12 A
KD7LJ 7,740 90 43 5 A
KJ7BN 3,392 53 32 24 A

W7RM (K7ST,op)
291,564 1869 78 24 B
WA7FOE 215,904 1384 78 19 B
W7OM 105,924 679 78 16 B
N7DOE 98,280 702 70 9 B
N7FL 23,790 183 65 13 B
KB7THX 10,500 105 50 9 B

W7DK (AJ7R,KB7s QOP,STJ,UXP, QWH,N7s EPD,QHW,VGO, W7RFM,ops)
64,368 447 72 24 A
W7TI (+net)
49,920 320 78 15 B
ND7P (+WA7TTD)
18,126 159 57 16 A
K7NWS (KB7KYA,N7GVQ, WB7AEI,ops)
12,826 121 53 11 A

Wyoming

N7MZW 69,864 492 71 24 Q

NQ7Q 9,130 83 55 7 A

WS7W 103,950 693 75 14 B
KB7M 54,760 370 74 19 B

KC7EMR (+KC7FLX)
43,344 344 63 24 A
WB7S (+N7YGN)
31,390 215 73 15 A
N7PLJ (+KC7FIM)
13,356 126 53 11 A

8

Michigan

K8LJQ 19,440 162 60 18 Q
N8JM 12,600 105 60 7 Q
KB8VVY 22 11 1 9 Q

W8MJ 190,632 1222 78 24 A
WZ8T 72,288 502 72 19 A
K8CV 50,662 347 73 24 A
KC8CY 46,080 320 72 22 A
K8RDJ 45,968 338 68 15 A
K8SB 45,792 318 72 16 A
WA8RRR 44,988 326 69 6 A
WA8FRD 44,928 312 72 19 A
WA8QAF 41,464 284 73 12 A
K8GVK 40,200 300 67 11 A
KB8QDI 38,184 258 74 17 A
WD8S 37,884 246 77 17 A
W8KZM 37,592 254 74 11 A
N8KR 36,972 237 78 5 A
KB8IBS 33,696 216 78 20 A
KT8X 33,288 228 73 8 A
W8TJQ 29,110 205 71 16 A
AA8VG 28,512 198 72 19 A
N8QVP 27,336 201 68 12 A
K8SAK 23,010 177 65 8 A
WA8OLD 22,692 183 62 15 A
WD8NFX 21,900 150 73 9 A
W8EO 21,480 179 60 24 A
N8LIQ 20,988 198 53 13 A
WB8BUQ 20,460 165 62 5 A
WB8AFO 20,412 162 63 14 A
W8KC 19,630 151 65 5 A
WA8YPY 19,096 154 62 15 A
NX8K 17,732 143 62 15 A
K8EN 16,986 149 57 22 A
AA8JN 16,254 129 63 24 A
WD8R 15,250 125 61 10 A
WB8HBJ 14,934 131 57 8 A
KB8HGM 14,190 129 55 15 A
KG8XN 12,430 113 55 12 A
K8GO 12,430 113 55 15 A
W8EGI 11,664 108 54 8 A
N8ZFH 10,900 109 50 17 A
N8TDE 10,528 112 47 10 A
KE7UA 10,296 117 44 5 A
N8MK 10,200 100 51 5 A
N8VEN 10,080 105 48 9 A
WD8KZP 8,400 105 40 8 A
W8PGW (W8UE,op)
8,268 106 39 3 A
KC8BXK 8,112 104 39 9 A
KG8LE 6,804 81 42 13 A
AA8UU 5,548 73 38 7 A
W8PPG 4,680 65 36 8 A
WD8KZX 3,900 50 39 5 A
KG8UC 3,498 53 33 3 A
W8ROS 2,940 49 30 6 A
KE8QT 2,250 45 25 3 A
K8SIA 2,072 37 28 1 A

W8QIY 1,302 31 21 3 A
WD8KZO 792 22 18 1 A
KB8JPD 32 4 4 2 A
KB8SLD 4 2 1 1 A

K8CC (K9TM,op)
272,064 1744 78 24 B
AA8U 247,572 1587 78 24 B
KE8KG 147,108 943 78 23 B
AA8R 140,244 899 78 19 B
AA8PA 113,724 729 78 20 B
N8KSO 80,784 561 72 15 B
WB8MTT 63,190 445 71 7 B
KG8OU 31,500 210 75 19 B
N8KZG 25,422 223 57 13 B
KG8HZ 18,224 134 68 10 B
N8SMI 10,656 111 48 12 B

NU8Z (AA8HZ,K8AQM,KG8EF,ops)
246,480 1580 78 24 B
KG8CW (AA8E,K8KG,KG8CO,ops)
233,064 1494 78 24 B
W8JJ (+K8MM,NA8G)
200,460 1285 78 24 B
W8TNO (K8s NWD,ZZU,KE8UY, N8SNM,WB8ZOM,WD8PLE,ops)
184,954 1201 77 24 B
NT8V (AC8W,K8DD,N8CQA,W8XI,ops)
150,072 962 78 24 B
K8ET (+KF8LA)
100,152 642 78 18 B
WA1LRL (+net)
96,720 620 78 21 A
KB2VCK (+ops)
55,650 371 75 23 B
ND5S (+net)
39,150 261 75 16 B
K8FT (+KC8EDL,N8OEO)
38,624 272 71 20 A
KF8YC (+ops)
37,740 255 74 15 B
KD8FS (+net)
29,260 190 77 15 B
KC8ELY (N8s MMF,NJE,YXP,ops)
24,684 187 66 20 A
N8OSL (+N8XTP)
20,764 179 58 21 B
AA8KR (+N8WIQ)
18,816 147 64 11 A
KG8QT (+KC8EMO)
14,732 127 58 10 A

Ohio

WA8RJF 31,950 225 71 12 Q
W3AW 10,080 90 56 6 Q
N8AXA 5,840 73 40 24 Q

K8JZ 175,656 1126 78 24 A
K8BL 124,800 800 78 19 A
WB8APJ 105,120 720 73 22 A
W8UPH 55,238 389 71 16 A
WA8YRS 53,818 379 71 13 A
WA8KIW 50,024 338 74 18 A
N8AA 46,800 300 78 8 A
W8XY 45,942 403 57 10 A
N8OH 45,080 322 70 11 A
N8WL 44,550 297 75 15 A
N8FSP 36,636 258 71 21 A
WZ8A 33,600 240 70 17 A
N8PCN 31,390 215 73 24 A
WD8AJF 24,832 194 64 8 A
KG8QL 22,792 148 77 24 A
N8FSQ 21,672 172 63 13 A
WT8P 21,504 168 64 13 A
WB8ORV 20,608 161 64 24 A
WA8LOW 18,648 126 74 12 A
N8KOJ 16,560 138 60 14 A
N8RVR 16,008 138 58 19 A
AA8XU 15,290 139 55 12 A
N8MEY 12,500 125 50 5 A
WJ8Y 12,168 78 78 14 A
NS8O 11,872 112 53 6 A
W8FDV 11,660 106 55 16 A
KB8SHE 11,616 121 48 13 A
N8ATT 10,716 114 47 6 A
K8OUA 10,492 122 43 7 A
W8DYF 9,568 104 46 9 A
KD8UC 8,004 87 46 12 A
K8NZ 5,520 69 40 2 A
AF8A 4,620 66 35 3 A
WA8RCN 1,496 34 22 2 A

KE8XK/200 864 27 16 2 A

K8MZ 223,860 1435 78 24 B
AC8E 110,448 708 78 17 B
KG8GO 70,376 463 76 13 B
KF8GE 63,656 436 73 24 B
KJ8I 61,650 411 75 24 B
NG8D 60,800 400 76 8 B
N8TR 50,076 321 78 12 B
K8MR 44,928 351 64 4 B
K8CX 42,432 272 78 7 B
W8FN 42,180 285 74 8 B
KJ8F 37,200 250 75 14 B
WA6EZV 25,740 165 78 9 B
KG8AP 18,352 148 62 12 B
W8PN 17,280 135 64 8 B

KW8N (+K8LR,KU8E,KF8TY)
325,728 2088 78 24 B
WZ8P (+KB8WFU,KE8YP,KF8NZ, N8s OFK,WCU)
101,400 650 78 21 B
W8FT (AA8KJ,KA8ZMY,KB8LKG, N8s RMT,RTP,ops)
64,896 416 78 24 B
W8OS (+net)
46,800 300 78 9 B
KF8UN (+net)
32,760 210 78 23 A

W8MBI (AA8RZ,KB8s NPA,VYB, KC8s BOM,BXH,KC4IYD,KD8SC, W8LE,ops)
30,498 221 69 21 A
K8SCH (AA8KK,KB8JVK,KD4PYR, N8s KOJ,UYZ,YCL,NU8U,WA6EZV, WA8LOJ,WB4SUV,WB8OYT,ops)
28,576 188 76 21 A
W8VM/200 (AF8C,K8VUS,W8IDM, WB8ORV,ops)
28,032 192 73 15 A
N8HTT (+net)
27,768 178 78 11 A
N8CPA (+KB8SFF,N8s VJA,VQJ, WD8LQH)
17,400 150 58 20 A
ND8L (+net)
12,480 120 52 4 B
WA8ZTC (+net)
12,324 79 78 14 A

West Virginia

K5IID 56,672 368 77 22 Q

WA8WV 46,350 309 75 13 A
WA8MV 46,350 309 75 13 A
W8WV 17,732 143 62 13 A
K8UC 3,000 60 25 3 A

K3JT 148,356 951 78 22 B
W8ZA 44,020 310 71 24 B
W8PT 22,294 157 71 16 B

W9LT (+K8OQL)
196,404 1259 78 24 B
KF8UM (+N8VCF,KV8S)
135,564 869 78 18 B
K8RAT (+KB8UJX,WV8E)
60,450 403 75 22 A
AA8UL (+WA8KAN)
18,792 162 58 16 A
WA8ZDL (+net)
14,238 113 63 10 B

9

Illinois

K9ZO 2,800 50 28 1 Q
K9BG 2,480 40 31 3 Q

KK9A 216,528 1388 78 24 A
WA0AVL 133,848 858 78 23 A
N9VVV 112,728 732 77 22 A
K9MY 104,988 673 78 24 A
WD9CIR 86,240 560 77 21 A
N2CKZ 81,432 522 78 24 A
W9RM 77,000 500 77 9 A
KF9YL 60,066 423 71 19 A
WX9U 59,200 400 74 12 A
N9MSG 53,424 371 72 17 A
K9SB 50,400 360 70 16 A
N9STL 37,520 268 70 20 A
N9JF 35,840 256 70 24 A
AK9Y 30,378 249 61 11 A
KG9CD 29,346 201 73 24 A
WA9CCQ 25,704 204 63 11 A
W9VA 24,800 200 62 5 A
W9UIH (W0TPO,op)
23,064 186 62 13 A
K9ZM 19,942 169 59 10 A
W9MYY 18,924 166 57 18 A
KE9YR 18,688 146 64 5 A
K9MMS 16,936 116 73 10 A
N6NRH 16,588 143 58 8 A
N9DJ 16,188 142 57 24 A
KB9CYL 15,510 141 55 8 A
WI9B 15,038 103 73 22 A
KG9GK 14,278 121 59 16 A
AA9F 13,680 120 57 7 A
KA9HUH 13,542 111 61 13 A
N9KCS 13,530 123 55 8 A
N9QYI 12,954 127 51 24 A
W9BZP 11,448 108 53 11 A
N9CO 10,584 126 42 3 A
AA9NF 10,080 105 48 5 A
N9NJX 9,408 112 42 10 A
K9KJ 9,360 104 45 9 A
K9NA 5,934 69 43 9 A
WB9YSM 3,196 47 34 24 A
N9TUQ 2,760 60 23 7 A
N9ZNF 8 2 2 1 A

K9BGL 234,780 1505 78 24 B
WA9TPQ 157,716 1011 78 22 B
K9LUW 157,404 1009 78 21 B
K9CC 149,760 960 78 18 B
KD9ST 136,598 887 77 23 B
WD9HTC 126,672 812 78 24 B
WE9A 107,700 718 75 15 B
N9NCX 79,032 534 74 15 B
WD9GIG 37,752 242 78 19 B
WA9QNU 16,500 150 55 3 B
K9UQN 15,680 140 56 6 B
WA9DRE 12,600 126 50 6 B
K9PW 11,904 124 48 4 B
N9YCT 9,090 101 45 24 B
WA9SMY 6,250 125 25 24 B
KG9N 4,738 103 23 1 B
WA5ZZG 1,974 47 21 24 B

WO9S (+AB4RL,N9DC,WB9JNZ)
117,468 753 78 22 B
K0HMO (+N9KLI)
77,616 504 77 18 B
N9LCR (+AA9GG,KB9LIL.N9s RUC, YSE) 61,464 394 78 24 B
W9EM (+AA9QT,KB9LPM,NZ9Y, WD8HCR)
55,480 380 73 24 A
K9MOT (AA9AE,K9s JR,PW,RR, UQN,KA9NQG,KB9MPV,N9s KNS, MUC,ops)
53,700 358 75 21 A

N9PGO (+NW9V)
48,100 325 74 23 A
N9LJY (+KA9BZY,KB9OEX,N9s NPP, UIZ,VZA,WJJ)
18,326 119 77 21 A
KC9IL (+N9GHP)
16,800 150 56 6 B
WB9GKA (+WB9ZAJ)
13,356 126 53 24 A

Indiana

KX9X 48,706 343 71 20 Q
W9DZ 12,400 124 50 8 Q

W9AU 95,760 630 76 21 A
K9HD 78,156 501 78 21 A
WA1MKE 52,824 372 71 18 A
N9OBL 47,304 324 73 21 A
KF9WX 35,466 257 69 18 A
KE9I 31,044 199 78 11 A
KB9KID 24,676 199 62 19 A
WB9LRK 20,374 167 61 9 A
KB9NMU 19,920 166 60 24 A
WD9EJK 15,180 110 69 12 A
K9DIY 14,672 131 56 11 A
KO9Y 13,144 124 53 24 A
N9XDS 12,878 137 47 14 A
W4WQD 12,212 142 43 9 A
KF9NP 10,340 110 47 7 A

KB0C 117,312 752 78 19 B
K9RU 71,760 460 78 12 B
KJ9C 38,360 274 70 8 B
K9EY 23,552 184 64 6 B

N9QX (+KE9I,WD9GGY)
195,624 1254 78 24 B
W9UR (+ops)
104,550 697 75 16 B
N9FD (+KE4BAN,KD4DIJ,N9JRZ, N0KFO)
35,640 270 66 12 A
W9YB (+AD4OS,KE4USA,ops)
13,764 111 62 24 B

Wisconsin

WD9IAB 9,682 103 47 15 Q

WA1UJU 131,516 854 77 24 A
KE9QT 68,600 490 70 21 A
AA9BJ 42,366 307 69 24 A
K9CAN 39,000 250 78 15 A
K9XJ 38,304 266 72 14 A
AA9TB 35,328 256 69 18 A
AA9PB 31,244 214 73 13 A
AA9RB 28,024 226 62 8 A
N9NE 27,600 230 60 6 A
K9ARF 25,760 184 70 15 A
N9WAR 20,856 158 66 10 A
N9CIQ 19,296 144 67 7 A
K9QYC 18,720 120 78 9 A
W9GIL 12,168 78 78 24 A
KB9MSZ 11,236 106 53 8 A
W9LO 10,300 103 50 5 A
AA9RK 9,000 100 45 8 A
W9RZW 7,752 102 38 7 A
WB9HBR 7,488 104 36 10 A

WE9V (at KS9K)
292,344 1874 78 24 B
ND9O 71,000 500 71 24 B
AA9FW 14,850 135 55 11 B
N9WNU 9,792 102 48 24 B
KD9YY 3,000 50 30 8 B

K9BZ (+N9THK)
115,128 738 78 24 B
KC9GG (+KE9NJ)
69,750 465 75 23 B

Ø

Colorado

KA0WWT 74,228 482 77 21 A
N4VI 63,504 441 72 24 A
KB0UGE 37,248 291 64 20 A
W0ZA 27,860 199 70 10 A
KG0ZI 27,830 253 55 6 A
W0AS 23,688 188 63 10 A
W6NIZ 20,400 136 75 24 A
WA0ZTI 20,292 178 57 17 A
WB0HZL 20,164 142 71 15 A
KB0QAK 18,600 150 62 24 A
N5ZR 13,566 119 57 5 A
K0YBX 12,636 117 54 11 A

N2IC 352,092 2257 78 24 B
K0KE 268,008 1718 78 24 B
W7WM 187,668 1203 78 21 B
W0OSK 127,376 838 76 18 B
N7DR 28,080 260 54 3 B

W0GG (+WB7HVR)
204,516 1311 78 21 B
K0GAS (+KJ0G)
139,986 909 77 24 B
N0ZA (+K0s CL,UK)
114,848 776 74 24 B
N0RAB (+net)
112,632 722 78 15 B
KF0LA (+net)
15,756 101 78 14 A

Iowa

WN0G 129,500 875 74 20 A
N0AC 31,382 221 71 10 A
W0OF 30,290 233 65 18 A
AA0XY 23,714 167 71 22 A
KE0PT 20,944 154 68 16 A
AA0AI 18,392 121 76 12 A
WA9LKD 16,060 146 55 9 A
K0XD 13,804 119 58 24 A
K0RX 12,800 128 50 2 A
KB0NZR 11,328 118 48 20 A

N0IXY 9,450 105 45 9 A
K0EVC 6,840 90 38 10 A
KG0WU 6,536 76 43 24 A
WB0B 4,800 60 40 4 A

N0NI (AG9A,op)
293,748 1883 78 24 B
K0FG 87,828 563 78 19 B
WB0VFO 27,104 176 77 16 B
W0PPF 22,932 182 63 19 B

Kansas

W0QNX 51,900 346 75 24 A
N0WFN 37,440 240 78 18 A
KC0GL 34,416 239 72 18 A
K0BJ 33,810 245 69 6 A
WB0YJT 25,344 198 64 11 A
N0ZHA 25,172 203 62 18 A
KF0MJ 15,504 136 57 5 A
N0ZCU 14,080 128 55 11 A
KG0VA 12,852 119 54 10 A
WA0ZNC 12,750 125 51 6 A
N0JJO 9,240 105 44 4 A
KA0EIC 5,376 64 42 7 A

W0BH 79,092 507 78 12 B
NI0S 35,280 252 70 12 B

K0TQ (+AB0S,K0WA,W0CEM)
278,148 1783 78 24 B
W0AQ (+KB0s NUC,PKR,RWI,SQM, VHI,KE4FDP,KI0EJ,N0s LQT,MRZ)
58,520 418 70 24 A
AC0E (+net)
56,848 374 76 23 A
KA0BAT (+KA0BHO)
14,820 130 57 10 B

Minnesota

W0YHE 32,004 254 63 18 Q
N0UR 10,290 105 49 4 Q

N0AT 213,096 1366 78 24 A
AC0W 150,852 967 78 24 A
K0MX 136,032 872 78 24 A
K0OB 135,096 866 78 24 A
W0WDW 46,480 332 70 6 A
W0ZQ 43,200 300 72 8 A
N0AXL 43,200 300 72 12 A
KB0UPC 25,984 203 64 18 A
WB0MWG 22,168 163 68 15 A
K0MPH 19,952 172 58 8 A
W0UC 15,312 132 58 2 A
W0MN 14,522 137 53 9 A
N5GNB 10,918 103 53 12 A
WA0WOV 9,030 105 43 6 A
WA0AAM 9,020 110 41 12 A

KØHB 212,316 1361 78 23 B
NØIJ 209,594 1361 77 24 B
W9RXJ 11,550 105 55 5 B

KRØB (+AF9T,KBØKQA,KJØB,KSØT, NØBKL) 203,550 1357 75 24 B
KFØGV (+NØLIW)
151,320 970 78 23 B
WØEF (AAØs EF,U,KØs AD,BUD,EF, FC,KGØDK,NØs KBD,MGQ,MRR, NFU,NYH,WEI,WGØM,ops)
102,150 681 75 23 B
WØGJ (+net)
66,300 425 78 11 B
KØJA (+KØJE)
43,808 296 74 24 B
WTØN (+KBØs NIJ,SMN)
12,648 124 51 10 A
WØSW (KBØRMS,N7QMW, WØAB,WDØHXW,ops)
9,450 105 45 9 A

Missouri

NØEID 30,084 218 69 24 Q

WAØX 181,272 1162 78 24 A
WB4RDV 38,190 285 67 18 A
KK2G 35,332 242 73 11 A
WAØEQY 33,000 250 66 21 A
WBØQLU 32,568 236 69 15 A
KBØPTE 27,392 214 64 10 A
AAØRT 24,444 194 63 7 A
KØLWV 22,144 173 64 10 A
KBØRLO 20,286 147 69 20 A
KØYR 18,034 127 71 24 A
KGØYJ 13,750 125 55 19 A
AAØVE 11,336 109 52 8 A
WB9YTG 5,896 67 44 4 A

K4VX (K9PG,op)
297,492 1907 78 24 B
KMØL 176,124 1129 78 24 B
KMØR 61,256 494 62 7 B
W3DW 26,230 215 61 14 B
AD9P 14,224 127 56 7 B
KØJPL 10,082 71 71 9 B
NSØB 5,642 91 31 24 B

WØEEE (KBØs LYI,QQF,VLG, KC5WJN,N9VYE,NØs RRS,ZSE,ops)
52,682 371 71 24 A

Nebraska

KØIL 44,530 305 73 24 A
N9ARX 43,344 301 72 16 A
NØLAQ 18,760 140 67 10 A
NØSYY 16,872 148 57 17 A

K9RZ 107,856 749 72 11 B
WA6POZ 36,570 265 69 14 B

KØGND (+KØSCM,KGØXA,WAØWRI, WBØWSL)
161,928 1038 78 24 A
KBØJSU (+NØUJT)
143,836 934 77 24 A

KØUSA (AJØA,KGØEJ,WJØZ,ops)
32,604 209 78 23 A
NØHPP (+NØTRK)
19,380 190 51 17 A

North Dakota

WDØEWJ 30,240 240 63 18 A
WQØJ 28,810 215 67 17 A
KBØIXX 23,312 188 62 16 A
WØHSC (KBØIHM,op)
16,536 156 53 5 A
KIØDW 11,960 115 52 24 A

WBØO 59,540 458 65 4 B

KIØBZ (+KBØs RGU,SAA,KFØUK)
91,542 627 73 23 A
NYØC (+NØFBA)
65,408 448 73 17 B

South Dakota

KEØZ 630 21 15 2 A

WØSD (WDØT,op)
321,048 2058 78 24 B

NØUCR (+WØKXZ)
162,792 1071 76 20 B

Canada

Maritime-Newfoundland

VE9ZL 7,828 103 38 24 A

VY2LI 146,730 1005 73 19 B
VE9AA 11,858 77 77 24 B

Quebec

CI2AWR 49,956 362 69 19 A
VE2TSM 18,620 190 49 24 A
VE2SAI 12,800 128 50 18 A
VE2HLW 12,760 116 55 19 A
VE2KRZ 7,200 100 36 10 A

VA2GL 25,200 210 60 10 B

VA2MRX (+net)
7,344 102 36 12 A
VE2MAB (VE2s BRT,DWT,ESP,HAX, HRP,MJM,MPD,NHK,SJA,SMW,ops)
2,220 222 5 18 A

Ontario

VE3RM 66,750 445 75 19 A
VA3NR 40,256 272 74 9 A
VE3STT 40,194 261 77 14 A
VE3VET 29,328 188 78 10 A
VE3FMC 15,070 137 55 4 A
VE3OQZ 13,104 117 56 15 A
VE3WZ 12,138 119 51 11 A
VE3WIB 8,970 115 39 6 A
VA3TEE 4,288 67 32 6 A
VA3WTO 3,420 57 30 2 A

VE3VSM (+VA3CW,VE3IJM)
65,564 443 74 24 A
VE3SAR (VE3s DBF,JGR, VA3DEN,ops)
62,244 399 78 24 A
VE3ZTA (+net)
23,550 157 75 13 B
VE3ZTH (+net)
23,550 157 75 13 B

Manitoba

VE4GV 231,770 1505 77 23 A

Saskatchewan

VE5SF 163,176 1046 78 22 A
VE5GC 61,344 432 71 15 A
VE5CMA 46,240 340 68 24 A
VE5CPU 17,160 143 60 24 A

Alberta

VE6GK 26,928 198 68 6 Q

VA6JO 180,180 1155 78 20 A
VE6EX 102,096 709 72 12 A
VE6ATT 85,536 648 66 12 A
VE6DBH 73,438 503 73 24 A

VE6NN 28,860 185 78 18 B

VA6JY (VE6s DGG,JY,LCB,LDX, MK,ops)
212,472 1362 78 24 B

British Columbia

VE7TLK 101,550 677 75 21 A
VE7XT 26,532 198 67 10 A
VE6XD/7 7,614 81 47 8 A
VE7CYT 4,704 49 48 5 A

VE7SZ (VE7NTT,op)
325,260 2085 78 24 B

VE7NA (VE7s FCO,GDE,GPG,JLO, NEW,TWO,VFM,ops)
29,678 209 71 23 A
VE7UBC (VE7Ss CDL,TTQ,WRA,ops)
17,880 149 60 10 B

Northwest Territories

VE8EV 22,320 180 62 19 A

Yukon

VY1JA 116,116 754 77 24 B

Checklogs

AA9OV, AD4IE, K6SC, K8YRN, KB8RQU, KC5LZY, KC5PDY, KE3TE, KFØCK, KGØUA, KIØBJ, KR3O, N4CSF, VE7BOY.

Edited by **Steve Ewald, WV1X** • Assistant Field Services Manager

The ARRL Field Organization Forum

Field Organization Abbreviations

ACC	Affiliated Club Coordinator
ARES	Amateur Radio Emergency Service
ASM	Assistant Section Manager
BM	Bulletin Manager
BPL	Brass Pounders League
DEC	District Emergency Coordinator
DXFR	DX Field Representative
EC	Emergency Coordinator
LGL	Local Government Liaison
NCS	Net Control Station
NM	Net Manager
NTS	National Traffic System
OBS	Official Bulletin Station
OES	Official Emergency Station
ORS	Official Relay Station
OO	Official Observer
OOC	Official Observer Coordinator
PBBS	Packet Bulletin Board Station
PIC	Public Information Coordinator
PIO	Public Information Officer
PSHR	Public Service Honor Roll
SGL	State Government Liaison
SEC	Section Emergency Coordinator
SM	Section Manager
STM	Section Traffic Manager
TCC	Transcontinental Corps
TA	Technical Advisor
TC	Technical Coordinator
TS	Technical Specialist
VC	Volunteer Counsel
VCE	Volunteer Consulting Engineer
VE	Volunteer Examiner

ATLANTIC DIVISION

DELAWARE: SM, Randall K Carlson, WB0JJX— e-mail: WB0JJX@arrl.org. The results are in for the 1997 Delaware QSO party!! The leaders for the best overall score in DE, in each county, and from outside the state are: 1st Place DE W3PP, 2nd Place DE NY3C, 3rd Place DE WA3I; 1st place Sussex W3PP, 1st place Kent KE3UY, 1st place NCC NY3C 1st place outside (tie) K3WWP/QRP K5LH. 23 stations submitted logs for all over the country. Many thanks to the folks of the First State Amateur Radio Club for their efforts in bringing back this event. But more importantly many thanks to those that participated in the event. Hopefully as the word spreads the participation will grow. Many of the stations from outside the state appreciated the opportunity to work DE for WAS. Plans are all ready underway for the next QSO party next spring. Stay tuned for more details. Traffic(March): DTN: QNI 120 QTC 15 in 21 sess. DEPN: QNI 23 QTC 2 in 5 sess. SEN QNI 64 QTC 0 in 4 sess. K3JL 26, WB0JJX 5. 73, Randall.

EASTERN PENNSYLVANIA: SM, Allen R. Breiner, W3TI— SEC: WB3FPL. STM: W3KOD. SGL: W3BKF. OOC: W3DZI. ACC: N3IGA. BM: WA3PZO. ASM: W3BKF. ASM: WY3K. ASM: K3TX. ASM: WA3PZO. ASM: W3ZXV. Please be advised, as of May first all applications for an official emergency station appointment are to be processed through your county emergency coordinator. When applying for more than one section appointment use individual application forms FSD-187. Applications for ORS go to W3KOD. Applications for OO go to W3DZI. Applications for OBS go to WA3PZO. For additional details, drop your SM a line. The Tioga County ARC started their Adopt-A-Highway program early this spring. Their recent club program was a presentation by N2IED on equipment used by blind Handi-Hams. To whom it may concern, W3ZRQ is now K3NYX. The EC position for Berks County has been taken over by N3YMX. N3EHQ has been promoted to Lackawanna County EMA Radio Officer and N3KAE to deputy Radio Officer. They are both an Assistant EC in the county ARES. Responding to their SET on February 5 were: AA3AL, KA3IHR, N3EOL, KD3GG, WX3A, W3TWV, N3TBY, N3NMN, N3EKU, KA3AZO, N2SIO, N3OKB and WC3Z. The Keystone VHF club is now a Special Service Club. The Marple Newtown ARC also joined the Special Service club group. Their recent club program was a presentation by N3LMY of short wave, long wave and VHF DXing. K3FLY, one of our blind fraternity, is looking for some technical assistance from the Philadelphia area. The Mobile Sixers RC meeting program was a demo by W3JG on his "Pocket Packet". Ham gear is getting smaller every day. Your clubs VE team can get free publicity, register your exam dates with the VEC at League headquarters. Congrats go to these up-grades; N3SVV to General, WB3GCP and K2YIY to Advanced. N3UJG made it to the big "X". This must be the year for club organizational anniversaries. The Phil-Mont Mobile RC marks this their 45th anniversary and will operate a special event station W3AA. The Frankford RC will observe their 70th anniversary with a special full color certificate. The Carbon ARC will be celebrating their 50th anniversary. W3NM has been accepted at Haverford College. XYL and KA3FXX added a new harmonic to the shack, a baby girl. Arrangements have been made to hold the Annual EPA section picnic Saturday July 12 at Knoebels amusement grove. Elysburg, PA. This affair will combine the annual Traffic Netters picnic. Pavilion "N" has been reserved for us. Pack a picnic lunch, bring the whole family and greet, eat, and meet with your fellow section operators. Columbia-Montour ARC has offered their repeater for talk-in on 147.225 MHz. We hope you are all prepared for Field Day. Your SM will be available at W3CMA for any Field Day messages. Don't forget the snake oil and mosquito bite lotion. Gud luck to all. Tfc: W3KOD 751, N3DRM 606, W3HK 191, NR9K 174, AD3X 124, WN8TIH 114, W3IVS 104, N3EFW 89, W3IPX 66, WA3EHD 60, N3CSE 54, N3NNH 50, N3KYZ 48, WY3K 40, W3NNL 33, N3HR 33, W3JKX 33, W3KAG 30, N3AT 25, W3ZQN 22, N3AO 20, N3YLI 20, K3TX 18, W3TI 12, N3IRN 16, N3DCG 13, KA3LVP 13, W3TWV 12, KA3KMH 9, K3ARR 8, W3ADE 7, W3BNR 7, WA3CKA 7, N3AS 5, KD3TI 5, N3SIN 2, WB3GCK 2, W8SC 1. 73, Net reports: EPA 362 EPAEP&T 182, PTTN 164, PFN 126, MARCNET 29, LCARES 25, D6ARES 10, CCRAN 9, D8ARES 4, SEPTN 4, EPAS 1, MCOES 1 de Harry, W3KOD, STM

MARYLAND/DC: SM: Bill Howard, WB3V 410-551-6775 (wb3v@erols.com)—ACC: Tony Young, WA3YLO 301-262-1917. ASM: Jerry Gavin, NU3D 410-761-1423 (k2ilq@aol.com). ASM/RACES Coord: Al Nollmeyer W3YVQ. BM: Al Brown, WA3FYZ 301-490-3188 (Al_Brown@ix.netcom.com). OOC: vacant. SEC: Mike Carr, WA1QAA (bamcc@erols.com). 410-799-0403. STM: Bruce Fleming, N3EGF @ K3HKI 301-863-6582 (76136.2017@compuserve.com). TC: Bob Bruninga, WB4APR 410-553-6021 (bruninga@greatlakes.nadn.navy.mil). MDC Section Web home page www.erols.com/wb3v/mdc/ Please visit the MDC home page for all the latest links, information and more nets! NTS nets in the MDC Section: MEPN 3920 kHz LSB 6 PM daily. MDD 3643 kHz CW 7 PM daily, 10 PM daily. MSN 3717 kHz CW 7:30 PM daily slow speed training net. BTN 146.67 MHz FM 6:30 PM daily. It was nice to be able to thank ECs and DECs who attended the ECRO meetings, in person, for all the work they have done for the section. WA2WDT, N3QXW, N3WD, N8AAY, N3KAT, N3OZT, K3EF, WA3UJE, KA3PVS, and N3RVX attended, and KG6TU stood in for KE3FL. Reports received too late for the last section news are included here: CARR EC KE3FL reports 30 ARES members, 4 net sessions on 145.41 with liaison to MEPN. MDD, MSN, BTN, WVPN, and DTN. OES reports: KE3FL, 18 net checkins on emergency power (MEPN, FRED ARES, and CARET nets). AEC reports: KG6TU, lots of checkins (82 -MEPN, WVN, BTN, DTN, and CARET). At an ARES meeting, Phil demonstrated how to build a 1 amp power supply for running H-Ts from the AC line. CECI EC N3AJJ reports 18 members, no nets, 1 field exercise, and 2 eyeball meetings with RO K3UAV. Bill reports marginal communications path reliability between CECI EOC in Elkton and Pikesville. They are considering relay through HARF or KENT and are looking into a directional antenna for the EOC roof. The PEACHBEX was a success for ARES/RACES, and Bill had the opportunity to meet with representatives from the served agencies briefly during the exercise. The Green Mountain Repeater Association has recommitted to PRGE ARES. WA3YLO gave training in message handling, and will provide a 10 minute training session each month. The PRGE ARES net meets the second Tuesday of the month at 9 PM, and had 10 checkins. W3YD has agreed to send meeting notices to ARES members each month. 73 - Bill. With the nets: NET/NET MGR/QND/QTC/QNI: MSN/KC3Y/31/39/295, MEPN/KE3OX/31/112/579, MDD/WJ3K/58/155/272, MDD TOP BRASS//W3YVQ/160/N3DE/133/ KK3F/117, BTN/AA3LN/31/366/84, SMN/KE3OX/5/10/40. Tfc: KK3F 337, W3YVQ 160, N3DE 129, K3GHH 118, KJ3E 90, N3WKE 85, WA1QAA 70, KE3OX 68, WJ3K 61, K3USO 49, WD4FDT 46, KC3Y 42, N3MPV 14, N3EGF 12, N3RVX 10, WA3GYW 9, KG6TU 8, W3ZNW 4, Feb KE3FL 1. PSHR: W3YVQ 154, N3WKE 122, KJ3E 122, KC3Y 110, K3GHH 110, KG6TU/102, KK3F/99, KE3OX/99, WJ3K/89, WA1QAA 84, N3MPV 84, Feb KE3FL 74.

NORTHERN NEW YORK: SM, Chuck Orem, KD2AJ (@kd2aj),e-mail (kd2aj@arrl.org)—ASMs: WB2KLD, WA2AEA, N2ZMS, WA2RLW. ACC: WZ2T. BM: KA2JXI. OOC: N2MXR. PICs: N2SZK, WA2RXO. SGL/SEC: WN2F. STM: N2ZGN. TC: N2JKG. Thanks to all who attended the NNY LO meeting in Tupper Lake on March 22. It was a good meeting and a lot got accomplished. Congratulations to Tony Gagliardi, KB2OH, and Frank Kennedy, K2TTI, for 25 years of continuos membership in the ARRL. Both are Life Members. The OARC has obtained a club call, KC2BCS. The CVARC recently bought a 20 ft. construction site trailer that they are converting to an emergency communications vehicle and will be on display at the CVARC Hamfest June 7. Net Reports: QNI/QSP/QNI: Carrier 647/27/26, CVARCCPN 52/0/8, CVARCSN 55/0/54, BFSN 269/30/30, Geritol 339/2/21, JCRAC 535/19/31, LEWIS ARES 25/0/5, NDN 233/3/31, NYPON 296/271/31, NYPhone 345/438/31, NYS/E 336/159/31, NYS/M 243/151/31, OVARC Net 44/0/4, SIRR 908/5/31, Q NET 632/3/31. BBS reports B/P/QSP: KA2JXI 4098/1038/9 KD2AJ 6032/2132/148.

SOUTHERN NEW JERSEY: SM, Jean Priestley, KA2YKN (@K2AA), e-mail: ka2ykn@mosquito.com—ASM: W2BE, K2WB, W2OB, N2OO. SEC: W2HOB, STM: WB2UVB. ACC: KB2ADL. TC: W2EKB. SGL: KB2WKY. BM: KB2GNB. OOC: K2RGC. PIC/PIO: N2YAJ. TS: W2PAU, W2BE, AB2Y, K2JF, WB2MNF. About 15 years ago Burlington County ARES & RACES came together under similar thinking leaders. Since then an evolutionary process has been taking place. There has been cross-training between county and Hams that has lead to a mutual respect and understanding all around. Dispatchers and OEM officials have become hams and hams have been trained in ICS, CPR and HAZMAT. This year there will be two full drills with agencies such as DEP, DOT & HAZMAT involved. Fred, W2EKB is recuperating after a 5-bypass. He is limited in his activities but feeling much better. We wish Fred a complete recovery. For more than 25 years New Jersey Trail Ride Assn has conducted trail rides annually in the Jersey Pines. The rides are judged events. During the entire history of the NJTRA, logistical support & safety communications have been handled by dedicated hams. Without them activities would not have been possible because of the distances and terrain. Additional help is always welcome. Contact KA2YKN, N2GXL, WA2RHJ or N2WZA. W2HOB-4 322, WA2CUW 225, N2WFN 214, WB2UVB 203, AA2SV 198, W2AZ 101, KD4FQG 45, KA2CQX 37, N2FHJ 16, KB2CDB 12, W2HOB 8, N2MSM 8, N2AYK 6, N2ZMI 5, N2FHK 5, KB2VSD 4, N2SOE 4, KB2HJJ 4, N2SXO 4.

WESTERN NEW YORK: SM, William Thompson, W2MTA — Sure do hope you took time to send Atlantic Division Director Kay Craigie your own views on the future of Amateur Radio in all its ramifications; expanded privileges; expanded frequencies; expanded space travel; it's all a challenge, don't you know! CLUB NEWS: Rochester DX Association honored K2FR with the Club President's Award. TCARC's W6XR reports that the number of active hams in the USA is 300,000 once the Silent Keys (of both the living and dead) are considered. On the pros and cons of the Morse code issue, Nathan says, "How do you know you won't like it, if you have never tried it?" Binghamton ARA reports an upcoming special event with dedication of a historical site in the DL&W rail yard where a 1913 Marconi/Sarnoff radio tower remains on duty. APPOINTMENTS: (OBS) KE2VW, (DEC) N2KPR ARES Catskill District. Note: ECs are needed in Allegany and Schuyler Counties. SILENT KEY: Dave, KB2HUZ, was an inspiration to many in the Triple Cities thru his public service efforts in both Amateur Radio and other arenas despite his disabilities. PUBLIC SERVICE VIA AMATEUR RADIO: Stop and think on this for a moment—use of telephone lines, with or without digital internet capability, is not Amateur Radio. Amateur station operators should use Amateur Radio frequencies for passing formal Amateur Radio message traffic and NOT employ non-amateur methods such as Internet. Non-amateur communications methods are great for message deliveries to addressees or even to obtain a person's information for origination of formal amateur message traffic, but NOT for the amateur-to-amateur relaying of such message traffic. HAMFESTS: Cortland June 14, Batavia July 13, TCARC at Dryden Aug. 9, Rome Aug. 16, PROs at Chaffee Aug. 23, MOARC Fly-in Breakfast Aug.24, Hamburg Section Convention Sep. 20, Elmira Sep. 27; RAGS on Pompey Hills Oct. 25. DATALINK: K2DN R12/S2, KA2GJV R102/S61, N2LTC R224/S110, NY2V R3/S0, W4BNY R2/S3. February BPL: AA2CX, N2LTC, KA2ZNZ. (# denotes NTS Net.)

Net Name	QNI	QSP	QND	Net Name	QNI	QSP	QND
Early Bird, WB2IJZ	451	000	21	STAR-FM, N2NCB	355	039	31
NYS RACES, N2AGO	098	010	05	WDN/E-FM, N2JRS	425	122	31
NYSR-CW, W2MTA	023	005	05	NYS/E-CW, WI2G	336	159	31
NYS/M-CW, KA2GJV	243	151	31	OMEN ARES, K2DYB	032	003	03
WEST-FM/SSB, AA2CX	775	1246	15	Oneonta ARC, N2KPR	041	005	04
Clearing House, W4BNY	240	089	31	TIGARDS-FM, W2MTA	041	005	05
WDN/M-FM, AF2K	392	070	31	BRVSN-FM-WB2OFU	301	006	31
NY Phone, N2LTC	345	438	31	CNYTN-FM, WA2PUU	328	054	31
NYPON-3925, N2JAW	296	271	31	OCTEN/L-FM, KA2ZNZ	504	210	31
ESS-CW, W2WSS	402	134	31	WDN/L-FM, KB2TIY	401	081	31
NYSPT&EN, WB3CUF	398	050	31	NYS/L-CW, W2YGW	186	108	31
OCTEN/E-FM, KA2ZNZ	1266	228	31	VHF THIN-FM, N2JRS	006	000	01

(*Denotes Public Service Honor Roll) Traffic (Feb.): N2LTC*94, KA2ZNZ*733, AA2CX*504, KF1L*459, WB2IJH*445, K2BCL*438, W2MTA*417, KA2GJV*333, WI2G*243, KB2UKF*230, K2DYB 228*, AF2K*198, NN2H*123, NY2V*109, KB2TIY*107, WB2QIX*106, W2FR*102, KG2D*77, KB2KOJ*63, KB2UQZ*57, N2OJI*55, K2DN*52, W4BNY*44, KB2ETO*42, W2PII*42, KB2YSJ*39, KB2WII*37, KA2DBD*30, N2SSS*26, AA2ED*25, KA2IWK 19, N8JSO*13, KB2YQE 12,

Continued on page 126.

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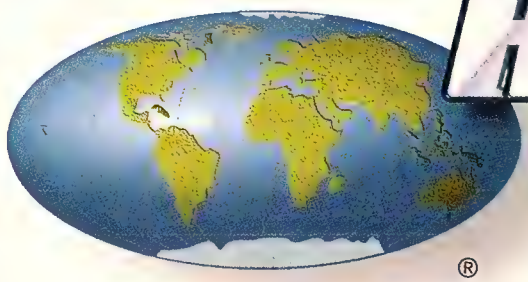

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Newly Designed DSP • Twin PBT • Dual Watch
5-100 variable-control watts of 100%
stable output power (5-40 W on AM)
PC Programmable (Optional CT-17 required)

See the Mar.'97 ARRL Review!

IC-821H All Mode Transceiver

2 M/440 MHz
Continuous Adjustable Transmit Power
Sub Band Transmit
9600 Baud Plug and Play
Multi-Function Scanning
Built-in Electronic Keyer
160 Memory Channels

Come in and hear the difference with IF-DSP!

IC-775DSP HF Transceiver

- 200 W (SSB, CW, RTTY, FM, AM)
- Tx/Rx DSP with Noise Reduction/Auto Notch
- Twin Passband Tuning
- Dual Watch
- Built-in Antenna Tuner

$100 Rebate! See your HRO dealer for details! (Limited to stock on hand)

IC-706 All Mode Transceiver

- 100W HF + 6M/10W 2M
- All Modes including FSK
- Detachable Control Panel and Display
- 102 Alphanumeric Memories
- Noise Blanker

NEW!

IC-207H Mobile Dual Band Transceiver

- 2M/440 MHz
- Tx 144-148 MHz, 440-450 MHz
- Wide-Band Rx (includes Airband)
- 4 Power Settings per Band
- 45 W VHF (2 M), 35 W UHF (440 MHz)
- 9600 BPS Packet Ready
- CTCSS Encode/Decode
- Built-In Duplexer

NEW LOWER PRICE!

FULL CONTROL DTMF Mic!

IC-2710H Dual Band Mobile Transceiver

- 2 M/440 MHz
- 50 W VHF/35 W UHF
- 220 Memories
- PC Programmable
- High Speed Scanning
- RF Attenuator

IC-2000H Mobile Transceiver

- 2M w/ Expanded Rx
- 50 W Tx
- Superior Wide Rx (118-174 MHz)
- 50 Memories
- Alphanumeric ID
- Rugged Aluminum Frame

FREE DOS Programming Software included for a limited time.

IC-W32A

Dual Band Transceiver

- 2 M/440 MHz
- 5 W @ 13.5 V
- Simple Operation (No Function Button)
- VHF/UHF Exchange Function
- Unit to Unit/Computer to Unit Cloning Capabilities
- 200 Memory Channels with Easy Alpha Naming

PRICE REDUCED!

IC-T22A

- 2M FM Transceiver
- 5 W @ 13.5 V
- 4.0 - 16 V DC Input
- Auto Low Power/Power Saver (15 mA Drain)
- 40 Memory Channels w/Alpha Display
- VHF Air Band Rx
- Auto Repeater Function

FREE DOS Programming Software included for a limited time.

IC-T7A

Designed for Easy Operation!

- Dual Band Transceiver
- 2 M/440 MHz
- 4 W VHF/3 W UHF
- 70 Memories
- CTCSS Encode/Decode Included
- Great Audio

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IC-T2A 2 M Transceiver

- 4.5 Watts of Power
- TX 140-150 MHz, RX 136-174 MHz
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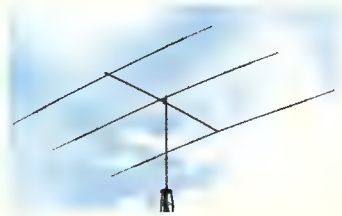

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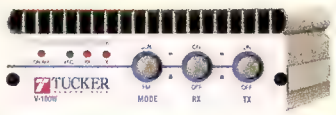

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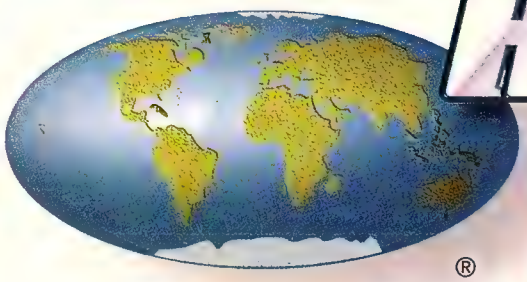

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- DTMF 16 Digit Memory
- DTSS + Multi-scan
- Wireless cloning

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NEW BLACK COLOR
NEW SBB-5/SBB-5NMO • Dual-band 146/446MHz w/fold-over
Wave: 146MHz 1/2 wave • 446MHz 5/8 wave x 3 • Length: 39" • Conn: SBB-5 PL-259/SBB-5NMO NMO •
Max Pwr: 120W
CX-224/CX-224NMO • Tri-band 146/220/446MHz w/fold-over
Wave: 146MHz 1/2 wave • 220MHz 5/8 wave • 446MHz 5/8 wave x 2 •
Length: 36" • Conn: CX-224 PL-259, CX-224NMO NMO • Max Pwr: 100W
B-20/B-20NMO • Dual-band 146/446MHz w/fold-over
Wave: 146MHz 1/2 wave • 446MHz 5/8 wave x 2 • Length: 30" •
Conn: B-20 PL-259/B-20NMO NMO • Max Pwr: 50W
SH-55 • Super Flexible 146/446MHz HT Antenna
Length: 15.5" • Conn: BNC • Max Pwr: 10W
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KB2YSI*12, WA2UKX*11, KB2SCF 10, KB2VVD 6. Folks, it's Field Day time! A time to go demonstrate and have fun! 73. w2mta@juno.com.

WESTERN PENNSYLVANIA: SM, Bill Edgar, N3LLR—ASM: N3MSE. ASM: N3FQQ. ASM-ARES: WB3KGT. ASM-Packet: KE3ED. SEC: KB3A. STM: WB8KPE. TC/OOC: WR4W. BM: KC3ET. ACC: AK3J. PIC: W3CG. DEC-N1: N3YHP. DEC-S1: AA3CI. DEC-N2: KD3OH. On April 5th, the WPA Section Club president's Conference and on April 6th, the Emergency coordinator's Conference was held in DuBois. We had some very good discussions on a wide variety of topics. A number of clubs expressed concern over a declining club membership. One suggestion given to combat declining memberships was to reduce the time for the business meeting, and to schedule interesting topics for presentation at the club meetings. John Rodgers, N3MSE, announced that Bruce Watson, AA3LX, was awarded the WPA Section Educator of the Year award for his efforts in helping teach others about getting involved in the hobby. At the EC Conference, Robin Hopkins, the Executive Director of the Jefferson County American Red Cross Chapter gave a presentation on how Amateur Radio helped during the July 1996 Jefferson County floods. Several changes in WPA Section appointments were announced. John Rodgers N3MSE was appointed to the Assistant Section Manager of our section. Tony Zona, WB3KGT, was appointed to the ASM-ARES appointment from the SEC appointment. Chris Robson, KB3A, was appointed to the Section Emergency Coordinator appointment from DEC-Rapid Response Team. Tony Petrocelli, KE3ED, was appointed to the ASM-Packet appointment. Replacements are being sought for ASM-Education and DEC-Rapid Response Team. John and I will be traveling around to various Field Day sites and filming them for our WPA Educational & Recruitment video. If you'd like us to visit your Field Day site, please send us information so we know where to find you! Have a good Field Day! Tfc: N3ON 43, WB8KPE 65, N3WAV 45, KA3EGE 40, N3KB 43, KC3NY 28, WA3QNT 25, N3COR 142, W3GJ 39, W3NGO 75, *WA3UNX 76, N3PBD 28, N3RDV 14, KB3BGZ 25.

Net name	*Net Mgr*	*QNI*	*QTC*
WPA Phone	KA3EGE	482	105
WPA CW	N3COR	180	72
Mailbag	N3PBD	392	35
NWPA2MTN	WA3ZSC	1,017	37
WPA2MTN	KA3BGC	311	61

73 de Bill N3LLR

CENTRAL DIVISION

ILLINOIS: SM, Bruce Boston, KD9UL—SEC: W9QBH. SGL: WA9AQN. ACC: N9KP. BM: K9EUI. STM: K9CNP. PIC: N9EWA. TC: N9RF. OOC: KB9FBI. ARES Emergency Coordinators from the east-central Illinois attended a meeting on March 15 at the MARK clubhouse in Bruce, IL. WD9CIR spoke to the group about the National Weather Service office in Lincoln, the kind of weather information they need, and the reporting procedures to use during organized weather spotter nets. K9ORP spoke to the group about the benefits of using APRS during weather spotter deployments. KD9UL discussed the services available to ECs from the ARRL and modifications to the OES job description. During a recent meeting of the Starved Rock RC members learned how to assist the local chapter of the American Red Cross in ways other than just radio. Many chapters offer free training in damage assessment, mass care and other subjects of value to the community during times of disaster. ECs should always remember that the agencies we assist can also be an excellent source of training for ARES members. The Section Manager met with several members of the section cabinet recently to discuss progress since the cabinet meeting at the ARRL National Convention in Peoria. The meeting took place April 5 in Bloomington following the annual meeting of the Illinois Repeater Association. The cabinet discussed organizational issues, a new request for club affiliation, and updates to the section Web page (www.inx.net/~spaceage/ilarrl.htm). The Illinois Section thanks the IRA for allowing us to use their meeting facilities. The section cabinet plans to meet again during September. Members of the 6 Meter Club of Chicago assisted with the Hoops for Life tournament sponsored by the American Cancer Society. The North Shore RC newsletter *Transmitter* reports the Skokie Historical Society has an exhibit about communication running through June. Admission is free and the exhibit is open on Saturdays from noon to 4 PM. The Hamfesters ARC has named Al Bukowski, WB9ZKD, as their Hamfester of the Year. The award was presented by last year's winner.

Net	*Freq*	*Time (Local)*
ISN	3.905	1800 Daily
ILN	3.665	1830 & 2200 Daily
ITN	3.680	1900 Daily
CTN	147.090+	2100 Daily
IL ARES	3.905	1630 1st & 3rd Sunday
Macon Co	442.250+	2100 Wednesday
IEN	3.940	0900 Sunday
IPN	3.855	1645 M-F; 0830 Sunday
NCPN	3.912	0700 Monday-Saturday
NCPN	7.270	1215 Monday-Saturday

Midwest Traffic Net de K5UPN for January QNI 189 QTC 127 in 23 sessions, for February QNI 199 QTC 265 in 20 sessions. March traffic: W9HLX 128, WB9TVD 35, NC9T 18, KA9IMX 10, WA9RUM 7, W9FIF 6. ISN de WB9TVD QNI 251 QTC 90 in sess 31. ISN 31 sess QTC 90 via WB9TVD, ILN 62 sess QTC 44 via K9CNP, ITN 27 sess QTC 22 via KF9ME, NCPN 26. sess QTC 47 via W9OUF, IPN 26 sess QTC 23 VIA KA9CYJ, IEN 5 sess QTC 3 VIA K9HEZ. W9VEY Memorial Net de K9AXS 7 with 293 check-ins.

INDIANA: SM, Peggy Coulter, W9JUJ—SEC: K9ZBM. ASEC: WA9ZCE. STM: AA9HN. OOC: KA9RNY. SGL: WA9VQO. TC: KF9IQ. BM: KA9QWC. PIC: KB9LEI: Sympathy extended to the families and friends of Silent Keys 3/9, Jerry R. Rust, N9YAX, Kokomo; 3/21, Carl E. Gropp, WB9LWP, Westville; 3/28, Fay A. Gehres, W9AIN, Evans-

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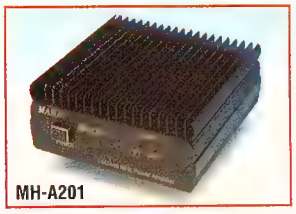

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ville; and 3/30, Ernest L. Dellingner, K9SJR, Chesterfield. They will be sorely missed. We have a new staff member added to our list, Jim McDonald, KB9LEI. If interested in Public Information or Public Relations contact Jim. Hope to see you at the Central Division Convention Jul 12 & 13 at the Marion Co. Fairgrounds, Indpls. Come to the ARRL Booth and say hello. Boone Co ARC literally got their feet wet when helping with communications at a fire that was located on a US highway and near a state road. There were multiple fire dept. and police agencies at the scene. Those helping were KE9YZ, KB9NPP, KB9OFB, N9RAB, KB9NPO and N9TLS. In another incident, they set up liaison to the EMA frequency. It worked well with N9ILZ, KB9NPP, KE9YZ, KE9ZJ, KB9OFB and WK9D. In the Boone Co ARC newsletter was an article that Paul, N9NVG, has found a code converter that will convert sound to light flashes for the hearing impaired. Muncie Area ARC rededicated their club station located at the Hoosier Heartland Chapter of the American Red Cross. They operated a special event and will send QSLs to all that they contacted. The Clark Co ARC had a workout during the flood emergency with communications at the Red Cross shelters and Command Center. Those assisting W4WQD, WD4IXL, N9KMG, N9BWG, NM9A, W9CBQ, KA9TYL, K9QWK, AA9GY, KB9OVC, KD4IKT, KG9IT, N9OKI, N9DPR, KB9KEC, N9FQF, N9TV, W9TDI, NJ9U, N9MDT, N9JVS, N9RMG, N9RMR, KB9AVV and KB9KXZ. NMs ITN/W9UMH, QIN/WB9TUS, ICN/AA9HN, WN/AB9AA, VHF/AA9HN, BBS/WJ9U.

Net	Freq	Time/Daily/UTC	QNI	QTC	QTR	Sess
ITN	3910	1330/2130/2300	2489	632	1598	93
QIN	3656	1430/0000	230	129	703	46
ICN	3705	2315	135	39	636	30
Hoosier VHF nets (11 nets)			1115	63	1555	61

Tfc: W9UMH 158, K9GBR 140, KO9D 126, WB9TUS 90, WB9QPA 87, WA9QCF 71, K9PUI 69, KA9QWC 59, KA9EIV 59, AB9AA 53, AA9HN 46, K9OIM 44, N9ZZD 33, W9UEM 33, W9EHY 32, KA9DIG 25, K9RPZ 14, N9JAI 13, KB9HFJ 10, WB9NCE 8, W9CSJ 8, KB9WI 5, W9KT 4, K9DIY 4, AB9A 3, W9XD 3, KB9NPU 2, K9OUP 2, N9VTF 2.

WISCONSIN: SM, Roy A. Pedersen, K9FHI—SEC: WB9SMM. STM: KA9KLZ. ACC: N9TD. SGL: W9RYA. OOC: AC9C. PIC: K9ZZ. TC: K9GDF. ASM: W9CBE, K9UTQ. BM: WB9NRK. Jerry Fadness changed his call from N9TSQ to W9GF. St. Croix Valley Radio Amateurs officers are pres. N9THK, v pres. KB9LUG, sec KBØWUK, tres. N9MLF. Meet every third Tuesday of the month, with fellowship, programs and discussion, also offer VE exams every even month on the first Saturday, dates are June 7, August 2, October 4, and December 6 (Dits&Bits St Croix Valley RA). Morse code is a very good way of communicating for those who are handicapped and with special needs. Debra King, N9GLG, is director of Morse 2000 Worldwide Out-reach, and promotes the use of Morse code in rehab and education. Sorry about the mistake in April *QST* page 116. WB9RQR is the Ozaukee EC not N9LLS. KB9OFI has his General. Sorry to report W9BXM a Silent Key. AA9RQ is now K9PQ. Don (N9HRD)and Edith Kramer celebrated their 60th wedding anniversary October '96. Ollie (W9FJE) and Leila celebrated their 64th wedding anniversary, also Lynn (K9KR) and Joanne celebrated their 36th, congratulations. Sorry to report W9AYK a Silent Key, also W9RNH. New Net Manager for Wisconsin Intrastate Net is W9UW. Hamtrix newsletter from West Allis RAC rated excellent in the 1996 ARNS publication. (Hamtrix). Congratulations to Sandi Bremer, N9TXU, on your achievement, now get your radio hooked up in your car.(Foxtales) Nice write-up in newsletter from Fox Cities RC about cell phones and ham radio, which is free for communications, and public service. (QSO'R FCARC). Badger Contesters Club has a new call KB9C. Special Event Station at this year's Midwest Renewable Energy Fair June 20-22 in Amherst, Wisconsin. The station would be powered by photovoltaic and wind electricity. Tfc: W9IHW 1851, WB9JSW 1598, K9FHI 341, W9CBE 296, W9RCW 275, N9BDL 136, N9CK 136, W9YCV 134, N9KHD 133, AG9G 83, W9UW 62, KE9VU 55, KA9KLZ 51, WD9FLJ 40, KA9FVX 37, K9JPS 37, KA9BHL 35, K9UTQ 33, KG9B 31, W9ODV 30, KB9ENO 29, NS9Q 27, WB9ICH 25, K9HDF 22, K9GU 22, N9JIY 18, W9PVD 11, K9LGU 10.

DAKOTA DIVISION

MINNESOTA: SM, Randy "Max" Wendel, NØFKU.—In fall of 1998, a planning conference for World Radio Conference 2001 will be held for 4 weeks at Mpls Conv Center, and is called the Plenipotentiary 1998, or, Plenipot 98. Delegates from around the world (approx 4000) will be here as well as an anticipated visit by Clinton or Gore. You know how important our spectrum is and what social value ham radio has to offer and the resource that the Amateur Radio service can be to our local communities and across our country in times of emergency events. You may realize what less fortunate societies are missing out on in other parts of the world who may have limited financial or government resources. Perhaps you may see why an Amateur Radio presence can play a key role at this event. Now throw in a completely operational radio station, provide various materials and publications for folks to take with them, make available some radio amateurs who can answer questions, assist in on-air visitor-guest operating, and run the project 7 days a week for 4 weeks, and you can see that a large number of radio amateurs will be needed. We're talking several hundred hams! Your help is needed! PLEASE HELP! Clubs from around the state are urged to help. Some PP98 planning meetings have started with hams who represent various local metro organizations and we need more to join the bandwagon. Who to contact: Jay-KØQB 612-222-7253 k0qbe@aol.com, or Mike, KØBUD, 612-542-8450 n0oel@aol.com. Yes, the e-mail call signs are correct in the e-mail addresses as I have them listed. Reminder, my contact info is also on page 12 of each *QST*. We welcome new ARES ECs: "Red" Haines-WOØW/ Houston, Jim Brown-KBØRGU/Wabasha, Kyle Fredrickson-NØLFF/Nobles, and Lee Lorentz, WBØTRA/Wright Co. We thank them for their volunteerism. Only metro counties left to fill are Dakota, Hennepin and Ramsey. Also, we continue to seek those interested as a designated OES. This is especially important during events such as the floods we've had and need

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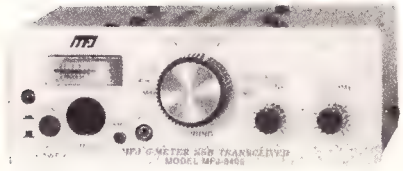

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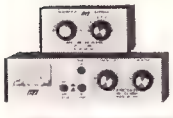

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as much help with communication. Thanks to all who were involved on the ARES Statewide HF Flood Net in early April. More next month. 73 de NØFKU. Activity reports: WBØWNJ, KBØAII, WØLAW, WAØTFC, WØHPD, KØPIZ, KN9U, KBØAIJ, KDØNM, KØWPK, KØERP, WDØGUF, NØAU, KØOGI, WØKYG.

NORTH DAKOTA: SM, Bill Kurtti, WCØM—Peace Garden Hamfast coming up July 11-13, Flea market, transmitter hunts, dealers, meetings, dance, breakfast Sunday morning & much more. ARRL convention coming up in Bismarck Aug 22-24 at the Radisson Inn in Bismarck. Enjoy all the activaties you have come to expect at ARRL Conventions including flea market, dealers, meetings, forums & much more. Congratulations to KBØZRL & KBØVHR upgrading to General. KBØVHH to Advanced & WBØVHW Aced both the Extra written & code in the same session. Also to KBØCHN for being named Ham of the Year by RRRA ND section. Hams are busy in many parts of the state helping fight floods, many at record levels. New calls are KBØFVB now NØEK, WDØH now NØTC, WDØATI now KØATI. I'm sorry to report that WDØDAF KAØNEW & WØWJK are Silent Keys. I'm sorry to hear that NØNSV has left the state to take a new job. KFØHR is now the AMSAT Coordinator. Nets Sess/QNI/QTC/Mgr.HF Nets: Goose River 3/27 /0 KEØXT; DATA 28/613/13. KEØXT. WX NETS 60/1158/31 KEØXT. VHF Nets:. NORTH 40 146.64 MHz 9 PM MT Sun 4/15/0; NØSIZ; MON-DAK 5/15/0, KBØIXX; SW-BELLES 5/24/0 KFØON.

SOUTH DAKOTA: SM, R.L. Cory, WØYMB—Contact our Public Information Coordinator Roger Kehm, NØHCR, to reserve the ARRL banner for your ham function. Dennis Hansey, WBØDAF became a Silent Key. He was from Scranton, North Dakota, but was known by many South Dakota hams. Lake Area Radio Klub members at Watertown are involved in establishing a communications center at the county emergency shelter. Using their new club call sign, three hams were staying at the emergency center due to severe flooding in the area. Participation in the Novice net for Feb was the best in four years with 34 checkins for the month. They meet Sunday 7 PM central time on 3700 kHz. Dakota Chapter 102 QCWA is looking into the possibility of obtaining a club call sign. South Dakota hams that have contacted me are against relaxing the license requirements in their comments relative to the proposed licensing structure. They also want a time limit on entry level license with no open book exam. This year, I hope that everyone will get out and support your local club with Field Day activities. Traffic report for March is 623.

DELTA DIVISION

ARKANSAS: SM, Roger Gray, N5QS, e-mail n5qs@arrl.org—Over the last month the response from the Amateur Radio community to the tornado damage in March has been excellent. Field Day is coming up, and I want to urge you to be careful. We can have a lot of fun, get in good preparation for real disasters, and be safe at the same time. Be sure to take care fueling generators, erecting antennas, and pay special attention to the heat. These are the most dangerous activities during Field Day setup. Good luck to all. Traffic: KF5YV 236, K5BOC 44, AB5ZU 36, KA5MGL 12, KO5E 8, KK5QS 5.

LOUISIANA: SM, Lionel A "Al" Oubre, K5DPG, e-mail k5dpg@arrl.org—ASM: KB5CX. ACC: KA5IJU. BM: K5ARH. TC: KE5FZ. SEC: KA5YDJ. OOC: WB5CXJ. PRC: KB5QVI. SGL: K5KV. STM: KG5GE. NM LEN: W5IT. NM LSN: WB5CDX. NM LCW: W4DLZ. As you are reading this, we are entering Hurricane Season 97. We all need to recheck our emergency operating equipment and procedures. When a disaster happens look to LTN 3910, LEN 3915. The LTN NM David KC5DAJ has resigned his position due to his school schedule. In next month's column the new NM will be announced. Thanks, David, for a job very well done during your tenure. We wish you good luck as you work to gain your degree. This seems to be a time of change. The LCW has changed its time to 6:45 PM local time. New club officers 1997: Jefferson ARC-pres KB4OGM, vp WA9TMC, sec WA5TRX, tr W5RMX. Up coming hamfests are: Slidell June 21, NO DX Convention Aug 22-23, Alexandria Sept 13. Louisiana Section Net Schedule: LTN 6:30 PM /3910 kHz nightly. LCW 6:45 PM / 3673 kHz nightly W4DLZ Mgr. LSN 8:30 PM/ 3713 kHz/ Mon-Fri/ WB5CDX Mgr. LEN 8:00 PM/ 3915 kHz/ Sunday/ W5IT Mgr. Reports for March 1997: LTN QNI 362 QTC 128 In 31 sessions; LSN QNI 63 QTC 15 in 21 sessions; LCW QNI 144 QTC 57 in 29 session; LEN QNI 53 QTC 1 in 4 Sessions. DRN5 LA Represented 100% by KG5GE, K5WOD, K5IQZ, WB5ZED, WB5CDX, KC5DAJ, KK5WG, K5DPG. PSHR: WB5CXK 77, K5WOD 83, KK5WG 86, KG5GE 112, WB5CDX 123, W4DLZ 127, WB5ZED 150, K5IQZ 154, K5DPG 172, K5MC 237. Tfc: K5WOD 5, WB5CXK 15, KK5WG 16, WB5CDX 22, KG5GE 38, K5DPG 121, WB5ZWD 130, W4DLZ 149, K5IQZ 232, K5MC 323 BPL.

MISSISSIPPI: SM: Ernie Orman, W5OXA—ASM: KJ5RC. SEC: N5ZDF. STM: KB5W. OOC, BM: W5EPW. PIC: AA5SP. SGL: KB5ZKK. TC: N4KMH. ACC: K5VXV. Home page is "http://users.aol.com/w5oxa/hpage.htm." Congratulations are in order for Malcolm Keown, W5XX, for being elected to the position of Net Manager for the Mississippi Section Phome Net. This net has been around for as long as I can remember. It used to be on 39875 kHz and then moved to 38625 kHz. My records go back to 1976, but I know that the net goes back to at least the early 60s. The net is very active for traffic, emergencies, weather watch and just plain local ragchewing. You can find someone from Mississippi on 3862 kHz almost any time of the day or night. Please support your new net manager as you all have in the past. Net reports for March: MS Baptist Hams: 5 sess, 25 QNI, 0 QTC; DRN5 62 sess, 568 QTC; MS rep 100% by W5OXA, N5XGI, W5HKW, W5JDF and NS5M. JC Emgr Net: 31 sess, 517 QNI, 27 QTC,166 EP; Laurel ARC: sess; 5 QNI. Lowndes Co ARC: 4 sess, 24 QNI, 0 QTC; Magnolia Net: 31 sess; 1066 QNI; 4 QTC. MSPN: 31 sess; 2553 QNI;72 QTC; MS Slow Net: 21 sess; 116 QNI; 2 QTC. MS/LA Emgr Net: 6 sess;109 QNI;1 QTC:1 emgr. sess. PBRA Net (North) 30 sess; 822 QNI; 224 EP; Stone Co ARES 5 sess;107 QNI, 0 QTC.

TENNESSEE: SM, O.D. Keaton, WA4GLS—ASM: WB4DYJ. PIC: W4TYU. SEC: WD4EKA. STM: WA4HKU. ACC: WA4GLS. OOC: AD4LO. TC: KB4LJV. At SRARC's March meeting, president Chet Konkle, KT4WZ, recognized Dave McDonald, KD4VWN, for his untiring support of the

MFJ 300 Watt *Roller Inductor* Tuner

World's only 300 watt AirCore™ Roller Inductor Antenna Tuner gives you absolute minimum SWR . . . Covers 6 Meters thru 160 Meters . . . lighted Cross-Needle meter . . . tunes any antenna . . . 8 position antenna switch . . . dummy load . . . balun . . . 1 year No Matter What™ warranty

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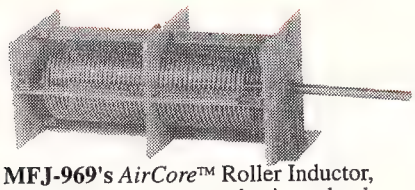
NEW MFJ-969 gives you MFJ's superb AirCore™ Roller Inductor and full 6 Meter thru 160 Meter coverage!

You get everything you've ever wanted including . . . 300 Watts PEP SSB full featured antenna tuner, widest matching range, lighted Cross-Needle SWR/ Wattmeter reads true peak forward power, QRM-Free PreTune™, 8 position antenna switch, built-in 50-Ohm dummy load and heavy duty 4:1 balun -- all in a tough, scratch-proof cabinet.

AirCore™ Roller Inductor



MFJ-969's *AirCore*™ Roller Inductor, three-digit turns counter and spinner knob gives you exact inductance control for *absolute minimum* SWR.

MFJ's exclusive *AirCore*™ Roller Inductor has an air core *that can't burn up!* You get ultra high-Q, the lowest loss, highest efficiency and highest power handling of any roller inductor in ham radio.

MFJ's exclusive *Self-Resonance Killer*™ keeps potentially damaging self-resonances away from your operating frequency.

Large self-cleaning wiping contact gives you excellent low-resistance connection without contact arcing or burning.

Solid ¼ inch brass shaft has self-align bearings for smooth non-binding operation.

Covers 6 Meters thru 160 Meters

The MFJ-969 covers *all* frequencies from 6 Meters through 160 Meters, *including the "magic band"* -- the widest matching range of any full featured antenna tuner.

Match any Antenna

You can match dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave receiving antennas -- nearly *any* antenna. You can use coax cable or balanced feedlines. Has heavy duty 4:1 balun.

Lighted Cross-Needle Meter

MFJ's lighted Cross-Needle Meter shows you SWR, forward and reflected power *simultaneously*. It reads *true peak* forward power and average power on 300 watt or 30 watt ranges.

Meter light has ON/OFF switch and requires 12 VDC or 110 VAC with optional MFJ-1312B, $12.95.

8 Position Antenna Switch

MFJ's 8 position antenna switch lets you select two coax fed antennas, random wire/ balanced line or built-in dummy load for use through your MFJ-969 or direct to your rig.

QRM-Free PreTune™

MFJ's *QRM-Free PreTune*™ lets you pre-tune your MFJ-969 off-the-air into a built-in dummy load without causing QRM.

Pre-tuning into a dummy load makes tuning your actual antenna faster and easier.

Full Size Dummy Load

The MFJ-969 has a *full size* non-inductive 50 Ohm dummy load.

You'll find it handy for tuning, testing and repairing your rig, setting power level, adjusting your mic gain and more.

Superior Cabinet

Each MFJ-969 cabinet has a new tough scratch-proof *vinyl* cladding. You won't find a tougher, longer lasting finish anywhere. Measures 3½x10½x9½ inches.

No Matter What™ Warranty

Every MFJ-969 is backed by MFJ's famous one year *No Matter What*™ unconditional warranty. That means we will repair or replace your MFJ-969 (at our option) no matter what for a full year.

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MFJ-989C world famous *3 KW* Antenna Tuner

MFJ-989C **$349.95**

More hams use MFJ-989s than any other 3 KW antenna tuner in the world!

The rugged MFJ-989C handles 3 KW PEP SSB and covers 1.8 to 30 MHz including all MARS and WARC bands.

Match dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave -- nearly any antenna. Use coax or balanced lines.

MFJ's new *AirCore*™ Roller Inductor, three-digit turns counter and spinner knob gives you exact inductance control for absolute minimum SWR. *It has an air core that can't burn up!* An exclusive *Self-Resonance Killer*™ removes damaging self resonances.

Two *massive* 250 pf transmitting variable capacitors with extra wide (0.27 inch) spaced stator plates can handle 6000 volts and amps of RF current for arc-free operation.

Lighted Cross-Needle meter lets you read SWR, forward, reflected power *simultaneously*. Read peak and average power in two ranges.

The MFJ-989C's six position antenna switch is made of two individual ceramic wafers wired in parallel. Wide spaced, heavy duty contacts handle extreme current and voltages. *We've never burned one up!*

MFJ's heavy duty current balun has two giant 2½ inch toroid cores with Teflon® wire connected to ceramic feedthru insulators. You can use balanced lines without core saturation or voltage breakdown.

A *full-size* 300 watt non-inductive 50 ohm dummy load is built-in.

Has convenient flip-stand. 10¾x4½x15 inches. Backed by MFJ's famous one year *No Matter What*™ unconditional warranty.

MFJ versatile *1.5 KW* Tuner

MFJ-962C **$249.95**

Use your barefoot rig now and have capacity to add a 1.5 KW PEP SSB amplifier later! Lighted Cross-Needle SWR/ Wattmeter. 6 position antenna switch, *Teflon*® wound balun, ceramic feedthru insulators for balanced lines. 1.8-30 MHz. 10¾x4½x14⅞ in.

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club's activities. It is always good to have personnel that can be counted on in all situations. Tri-County (Dresden) was started in 1954 by W4BMI, W4BQG, W4COY, W4BKT, W4RMJ and W4FLW, the club became ARRL affiliated in 1955. UCARS is in the process of upgrading its packet and voice repeaters, all area hams are asked to support this effort. The Rats Tale reports that the club's great inventory reduction sale has been very successful. The Feedline reports that the East TN SKYWARN program has fallen apart; this is a great loss for that area. How about getting together in East TN and revive the SKYWARN program in the Tri-Cities areas. The Middle TN Area Net meets each Monday at 7:00 PM local time on 145.470 repeater; check in and make yourself available for any emergency that calls for the ham's support. Glenda Bobolic of the Kingsport Chapter of the American Red Cross was speaker at the Feb meeting of BMRA/KARC; the message was concerning welfare traffic in times of disaster. Tennessee has been hit hard by tornadoes in some areas and hams have responded responsibly when and where needed. Thanks to all of you who had a part in making life more pleasant to the victims. Nets: sess/QTC/QNI: TMPN 31/51/2591, TCWN 24/37/203, TEPN 26/104/2819, TSCWN 26/14/57. Tfc: NZ4O 308, N4PU 156, W4OGG 126, WB4DYJ 37, KA5KDB 35, WA4GLS 30, W4SYE 19, WA4HKU 18, WD4EKA 17, KI4V 8, K4TAX 6, W4PSN 4, W4IKK 2.

GREAT LAKES DIVISION

MICHIGAN: SM, Dale R. Williams, WA8EFK @ WB8ZPN—ASMs: Larry Camp, WB8R. Keith Allen, N8QNA, and Dick Mondro, WA4FQT @WB8ZPN. ACC: Mike Pearsall, N8MP. OOC: Mark Drolias, N8IQX. PIC: Greg Ozimek, WB8FNQ. SEC: Roger Edwards, WB8WJV @ WB8WJV. SGL: Ed Hude, WA8QJE. STM: Dale Cryderman, KA9EIZ @ W8EHH. TC: Dave Smith, W8YZ. VHF/UHF Net Manager: Paul Harmer, KB8ZDV. Congratulations to Saginaw Valley ARA Ham of the Year Roger Candiff, KB8QO. Congratulations also to the new officers for the Genesee CoARC are pres KF8VG, 1st vp KB8ZDQ, 2nd vp W8JY, 3rd vp, KB8ORO, 4th vp KB8OEO, sec N8GI, treas WA8UXN. June is upon us, and so is the greatest operating event of the year: FD! It is the time to break out the mosquito repellent (first) and then the operating paraphernalia and have at it. The Motor City Radio Club has offered the Ivory J Olinghouse Award to the MI ARRL affiliated clubs for the highest percentile ranking in the FD event since 1977. The award is presented in the memory of Ivory J Olinghouse, W8ZBT, the MI Section Communications Manager (SCM) from 1970-1976. The Ivory J Olinghouse award is in the form of a beautiful plaque. Now, it seems this plaque has been won by the host club in most of the recent FD events, and according to MCRC Special Event Publicity Chairperson Ann Travis, KB8HGM, "...it has not received the visibility that was intended to honor Mr Olinghouse." As a result, the MCRC has, since 1993, presented award certificates to the second through fifth place ARRL clubs in MI, in an effort to expand that recognition. While it's true the MCRC truly deserves the award when they haul in the highest percentile score, their membership must wonder if anyone else is up to the challenge! Can this be true? There are many well known and active MI clubs who have held this award in the 19 years it has been presented. Your SM supports the challenge offered by the MCRC for those to recover the award, and for their clubs to step up to the challenge. The Ivory J Olinghouse Award will look great hanging on the wall at your club. March NTS Net Reports

Net	*Freq*	*Time*	*QNI*	*QTC*	*Sessions*	*NM*
QMN	3663	6PM Dy622	222	60		
GLETN	3932	0100 Dy	750	92	31	VE3SCY
MACS	3953	11AM M-Sa	379	77	31	K8OCP
MiTN	3952	6:45PM Dy	463	140	31	KA9EIZ
SEMTN	145.33	10:15 PM Dy	623	95	31	WI8K
TATN	147.30	9:30 Dy	425	284	26	WD8OEP
UPN	3921	5PM Dy	1689	57	36	WA8DHB
WSSBN	3935	7PM Dy	807	38	31	K8GOU
VHF (Combined)			707	39	249	KB8ZDV

QMN Feb report: QNI 528, QSP 150, Sessions 58

Tfc reports for Mar: KA9EIZ 235, W8RTN 183, N8FPN 152, AA8PI 142, WX8Y 103, WB8SIW 93, K8GXV 80, N8TDE 76, WA8JXG 71, WA8DHB 45, WD8OEP 36, K8JN 32, K8UPE 30, K8OCP 29, N8OSC 18, W8YIQ 18, W8RNQ 17, WR8F 15, W8LOU 14, N8KIR 12, K8ZJU 10, N8JGS 10, WB8WJV 7, K3UWO 6, KA8LAR 4, KC8GMT 4, WB8BGY 3, W8YZ 2, NJ8R 1.

OHIO: SM, David Kersten, N8AUH @ W8IZ (see p.12) or dave.kersten@irmg.com—ASM, John Haungs, WA8STX 513-782-6464. ASM (Packet): Steve Wolf, W8IZ @W8IZ. SEC: Larry Solak, WD8MPV 330-274-8240. STM: Joyce Judy, KD8HB @W8CQK. ACC: Joanne Solak, KJ3O/8 330-274-8240. BM: John Schlueter, W8WYH @W8BI. TC: John Fakan, KB8MU. SGL: Paul Krugh, N2NS @W8CQK. PIC: Beverly Priest, N8VZV, mapriest@erinet.com. OOC: Paul LaFollette, Jr. wb8ona@worldnet.att.net. It should be old news by now, of course, but Amateur Radio was quite involved with providing radio assistance during the severe flooding experienced along the Ohio River Valley back in March. Many nets were activated, many clubs & groups were active and agencies were well served by Amateur Radio. The Spring issue of *Ohio Section Journal* contained some quite detailed information about Amateur Radio's involvement, so I won't take up more space here to reiterate. Everyone who was involved deserves a big pat on the back. Hams who allowed operation of various repeaters, including the 145.19 wide-area system were very much appreciated by both the radio operators and the served agencies, as clear frequencies really make a difference. Thanks to all!!! There have been some changes in the requirements and responsibilities for official emergency stations, which hopefully you've all read about in Field Forum. If you didn't see that, let me know and I'll mail you a copy of the new Guidelines. It's not too early, so start thinking about the Ohio Section Conference: What topics will draw you to this meeting? What can we do to get you out and involved? Please contact Larry, WD8MPV, or me with your thoughts/ideas. Tnx. ARRL dues will soon increase, but remember you can join, renew or extend your membership at the old rate ($31) until July 1, 1997, at which time membership dues

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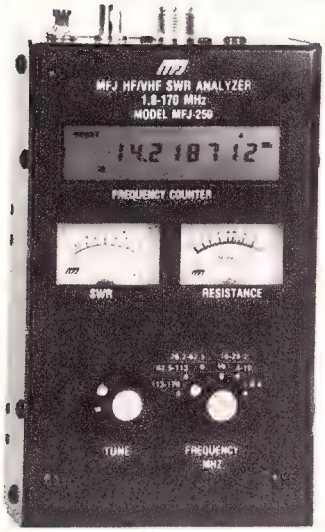

MFJ-259 **$239.95** If you work with antennas, MFJ's revolutionary new *SWR Analyzer*™ is the best investment you'll ever make! Now you can diagnose a wide range of antenna problems instantly with one easy-to-use instrument.

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The MFJ-259 gives you a complete picture of your antenna's performance anywhere between 1.8 and 170 MHz -- you can even check SWR outside the ham bands without violating FCC rules. Set the bandswitch and tune the dial--just like your transceiver. SWR is displayed instantly!

RF Resistance Meter™

Does 2:1 SWR mean 25 ohms or 100 ohms? *The new MFJ-259 tells you at a glance!*

Now you can measure RF resistance up to 500 ohms at minimum SWR -- instantly -- on MFJ's *exclusive* side-by-side RF Resistance and SWR Meters!

Take the guesswork out of building matching networks and baluns for your antennas.

Watch the effects of spacing on radiation resistance as you adjust your antenna.

Here's What You Can Do . . .

Find your antenna's true resonant frequency from the shack.

Tune the antennas on your tower and watch SWR change instantly as you make each adjustment. You'll know exactly what to do by simply watching the display.

Tune critical HF mobile antennas in seconds -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on a single band, or analyze multiband performance over the entire spectrum from1.8 to 170 MHz!

Measure inductance, capacitance, resonant frequency of tuned circuits, transmission line velocity factor/impedance/loss.Test RF chokes, transformers, baluns.

Adjust your tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The MFJ-259 is really *four* test instruments in one: an accurate RF signal generator, a high resolution 170 MHz frequency counter, *RF Resistance Meter*™ and an *SWR Analyzer*™.

Free Manual

MFJ comprehensive 18 page instruction manual is packed with useful applications -- all explained in simple language you can understand! **For** free manual write or call MFJ.

Take It Anywhere

The MFJ-259 is fully portable, powered internally by 8 AA batteries or 110 VAC with MFJ-1312B, $12.95. It's in a rugged all metal cabinet that's a compact 4x2½x6¾ inches. Take it to remote sites, up towers, on DX-peditions -- anywhere your antennas are located.

For rough service, pick up a convenient **MFJ-29B**, $24.95, padded carrying pouch to keep your MFJ-259 close at hand and looking like new.

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MFJ SWR Analyzers™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Professional installers and technicians use them worldwide.

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With the MFJ-259, you get full 1.8 to 170 MHz coverage, simple operation, instantaneous readings, a high accuracy frequency counter and MFJ's exclusive *RF Resistance Meter*™-- all for a low $239.95.

1.8-170 MHz *SWR Analyzers*™

MFJ-249 **$219.95** **MFJ-249** *HF/VHF SWR Analyzer*™. Same as MFJ-259 but less RF resistance meter. Includes 10-digit LCD frequency counter, *full* 1.8-170 MHz coverage and smooth vernier tuning.

MFJ-209 **$109.95** **MFJ-209** *HF/VHF SWR Analyzer*™ is same as MFJ-259 without LCD frequency counter and RF resistance meter. Has jack for external frequency counter, smooth vernier tuning.

Carrying Pouch with Window

MFJ-29B **$24.95** **Tote** your MFJ-259 /249/209 *SWR Analyzer*™ anywhere with this custom Carrying Pouch. Made with a special foam-filled fabric, it cushions blows, deflects scrapes, and protects knobs, meters and displays from harm!

Clear protective frequency display and window cutouts for knobs let you use it without taking it out of pouch. Fully adjustable webbed fabric carrying strap has snap hooks on both ends. Wear around waist or over shoulder.

Keep your analyzer safe and looking new! **MFJ-29**, $19.95, no window or cutouts.

Dip Meter Adapter

MFJ-66 **$19.95** **Plug** a dip meter coupling coil into your *MFJ SWR Analyzer*™ and turn it into a sensitive and accurate bandswitched dip meter.

With a dip meter you'll save time and take the guesswork out of winding coils, measuring inductance and capacitance, measuring velocity factor and electrical lengths of coax. Determine resonant frequency of tuned circuits and measure Q of coils. Set of two coils cover 1.8-170 MHz depending on your *MFJ SWR Analyzer*™.

440 MHz *SWR Analyzer*™

MFJ-219 **$99.95** **Read** SWR of any antenna 420 to 450 MHz -- just plug coax of your antenna into SO-239 connector, set frequency and read SWR. Uses microwave integrated circuits and microstrip technology. Jack for external frequency counter. 7½x2½x2¼ in.

MFJ-219N, $99.95, sames as MFJ-219 but with "N" connector.

MFJ-219 uses 9 volt battery or 110 VAC with MFJ-1312B, $12.95.

MFJ 2 Meter *FM SignalAnalyzer*™

Measure signal strength over 60dB range - Check and set FM deviation - Measure antenna gain, beamwidth, front-to-back ratio, sidelobes, feedline loss in dB - Analyze audio quality with scope

NEW! MFJ-224 **$159.95**

MFJ's revolutionary handheld 2 Meter *FM SignalAnalyzer*™ lets you measure signal strength with over 60 dB dynamic range; check and set FM deviation of your packet and voice radios; measure antenna gain, beamwidth, front-to-back ratio, sidelobe suppression and actual feedline loss in dB.

Plug in any scope and your MFJ *FM SignalAnalyzer*™ becomes a service monitor! It lets you visually analyze modulation waveforms, measure audio distortion, noise and instantaneous-peak deviation.

You can tune in any signal between 143.5 and 148.5 MHz. It's built-in discriminator-meter function makes accurate tuning simple and easy.

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Here are some countless jobs your MFJ *FM SignalAnalyzer*™ can perform . . . evaluate antenna performance, detect feedline faults, plot field strength patterns, position your antennas, measure preamp gain, track down hidden transmitters, check and set deviation, analyze audio quality, scan the band, tune transmitters and filters, and much more!

The MFJ-224 2 Meter *FM SignalAnalyzer*™ may be the most useful 2 Meter handheld test instrument you may ever own.

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MFJ . . . the world leader in ham radio accessories!

will become $34. Scheduled hamfests include - Goodyear ARC (Akron) June 8; Cuyahoga ARS (Macedonia) June 15; Milford ARC, June 21. Bob Johnson, K3RC/8, maintains the listing of AmateurRadio exams throughout Ohio: This list is available on the packet network. Net and Station Activity reports for March 1997 follow:

Net	QNI	QTC	Sess	Times	Freq	NM	Time
BN Early	173	93	31	1845	3.577	WD8KFN	333
BN Late	182	131	31	2200	3.577	NY8V	437
BNR	177	28	31	1800	3.605	W8LDQ	990
OSN	162	55	31	1810	3.708	WB8KQJ	493
OSSBN	2001	549	93	1030,1615 & 1845	3.9725 3.9725	KF8DO KF8DO	549
Ohio Section ARES Net				Sn 1700	3.875	WD8MPV	
BNR (Feb)	177	49	28	1800	3.605	W8LDQ	965

Tfc: W8PMJ 291, KD8HB 285, K8DHD 228, N8IXF 224, K8OUA WD8KFN 176, KA8HBN 149, W8PBX 133, N8DD 119, W8JLW 90, N8AUH 88, N8RBE 85, N8FWA 83, N8CW 81, K8QIP 79, W8RG 77, WA8SSI 63, N8VES 61, NS8C 61, K8JDI 57, WA8EYQ 52, WD8KBW 50, KB8ROA 48, N8TNV 47, KI8O 42, N8VVZ 39, KB8VYB 39, W8LDQ 38, N2NS 38, WB8KQJ 35,W8VEK 35, NY8V 26, KA8MPD 23, WB8REI 20, KB8TIA 19, WB8KWD 16, W8GAC 16, WB8HHZ 15, WD8MIO 15, KB8DUX 15, KC8FKH 14, KF8FE 12, K8WC 11, W8BO 11, KA8GOV 10, KG2BC 9, K8IG 9, W8GDQ 8, KC4IYD 7, N8WCT 7, N8LSG 6, AA8XS 5, W8HZ 4, N8CJS 3, N8VET 3, KB8SBK 2, KA8OQF 1, N8WLY 1. (Feb) W8PBX 114, W8LDQ 20, KA8OQF 13, W8GAC 3.

HUDSON DIVISION

EASTERN NEW YORK: SM Rob Leiden, KR2L (@ WA2UMX)—STM: Rick Warren, KF2YC. SEC: Tony Pazzola,WB2BEJ. ASM/ACC: Tom Raffaelli,WB2NHC. SGL: Phil Bradway, KB2HQ. PIC and BM: Steve Anderman, WA3RKB. OOC: Hal Post, AK2E. TC: Elmer Sharp, WA2YSM. ASM: Andrew Schmidt,N2FTR. ASM: Bob Chamberlain,N2KBC. ASM: Richard Sandell,WK6R. Net Reports (Mar 1997)

Net	QNI	QTC	QSP	Sess	Time	Manager
AESN	57	3	3	4	157	N2RAD
CD	497	102	94	31	510	WB2ZCM
ESS	402	134	134	31		W2WSS
HVN	363	139	121	31	629	N2JBA
NYS/E	336	164	159	31	404	WI2G
NYS/L	186	121	108	31	394	W2YGW
NYS/M	243	170	151	31	473	KA2GJV
NYPh	345	446	428	31	983	N2LTC
PON	296	273	271	31	778	N2JAW
SDN	525	145	123	31	687	N2DB

Many thanks to Shirley Dahlgren, N2SKP, Ken Akasofu, KL7JCQ, the Beacon Club, Director Fallon and the ENY Section Leadership for a great ENY Convention. I enjoyed the opportunity to meet many old friends and make many more. Congrats to Darlana, N2DB, for still another BPL. On a sadder note, Ted Goble, K2HNW, SCEN-75 Net Manager and traffic handler for many years, has become a Silent Key. Ted was both an example and a friend for all of us in the Capital District. Happenings: Field Day is the weekend of June 21,22. Please write and let me know where your club will be. I'm planning a marathon visit to all ENY sites. Hey clubs! If you want your own home page on the WWW, check out N2KBC's Hudson Division Home Page. He'll give you your own home page...check it out! PSHR: N2DB 244, N2YJZ 204, WB2ZCM 156, N2JBA 141 Tfc: N2YJZ 417, N2DB 262, N2JBA 78, WB2ZCM 73, N2AWI 43, N2JNG 11.

NEW YORK CITY/LONG ISLAND: SM, Len Buonaiuto, KE2LE—ASM: KB2WGT. ACC: N2PIF. SEC: WF2T. STM: WA2YOW. OOC: N2JIX. PIC: N2RBU. TC: WY2U. BM: KC2FD. SGL: W2OT. LGL: KA2RGI/Babylon. LGL: WA2KXE/ Long Beach, WB2MGP/ Staten Island. LGL: KB2TWO/ Queens. LGL: N2HH/ Oyster Bay. LGL: WB2ZIE/ E/ South Hampton. I am proud to report as of the first quarter in 1997 our section and its new staff are doing well. I want to thank all that have made my job easier and have made our section that much better.Our past years are in repair and our growth has been great. I would like to see more input from our members and events that they would like to share with all. Send in your stories and pictures to my address and I will do my best to get it the exposure it deserves. Our SGL Mark Nadel, W2OT, is in need of a few more LGLs for several towns in our section I would also like to see more OOs from our east end of Long Island. Contact N2JIX for an application and Job description. Monthly activity reports a must. Once again thanks to all my staff and our appointee's. Keep up the great work. NYC/LI VE exam list: VE Sessions: Islip Ares,1st Sat 9 AM, Islip Town Hall West 401 Main St. Islip, Addison Levi, KD2YA 516-234-0589. Bears VE: ABC Bldg Cafeteria, 125 West End Ave. At 66th St Call Hotline 212-456-5224 for exact dates & times, Jerry Cudmore K2JRC. Grumman Arc W5YI) 2nd Tues.5 PM Northrop-Grumman Plant 5 S Oyster Bay Rd via Hazel St Bethpage NY Bob Wexelbaum, W2ILP, 516-499-2214, LIMARC,2nd Sat. 9 AM NY Inst. Of Tech.400 Bldg Rm.409, Northern Blvd Old Westbury Al Bender, W2QZ, 516-623-6449. Gallups Island RA 3rd Sat 1 PM, USMMA, Bowditch Hall, Steamboat Rd. Kings Point NY, Les Rauber, AA2E, 516-922-0947. Great South Bay ARC. 4th Sun.12 PM Babylon Town Hall, ARES/RACES Rm 200 E Sunrise Hwy N Lindenhurst, Tom Carrubba, KA2DFO, 516-422-9684. Hellenic ARA: 4th Tues 6:30 PM, Pontion Society, 31-25 23rd Ave. Astoria NY, George Anastasiadis, KF2PG, 516-937-0775, Larkfield ARC: 3rd Sat 9 AM, Huntington Town Hall,100 Main St Huntington, NY, Joe Coffield, W2DDZ, 516-266-3192. Columbia U VE Team: 3rd Mon.6:30 PM, Watson Lab 6th floor. 612 W. 115th St. NY, Alan Crosswell, N2YGK, 212-854-3754. PARC: exams held every three months at Southold School Oaklawn Ave, Southold, NY on next to last Friday of the month.6:30 PM all classes of licenses. Next 7/ 18/97. For info contact Ralph Williams, N3BT, 516-323-3646. Report all changes to KE2LE before 12th of the month. Tfc: KA2VZX 723, N2AKZ 302, KB2KLH 134, N2WGF 128, N2XOJ 86, KB2WYE 63, KB2GEK 48, N2TQN 25, AA2NX 24, WB2ZIE 11, N2ZMZ 9, KC2ACL 7, KB2RED 4, WA2VZK 3, WB2CUQ 1.

MFJ *tunable* super DSP filter

Only MFJ gives you tunable and programmable "brick wall" DSP filters

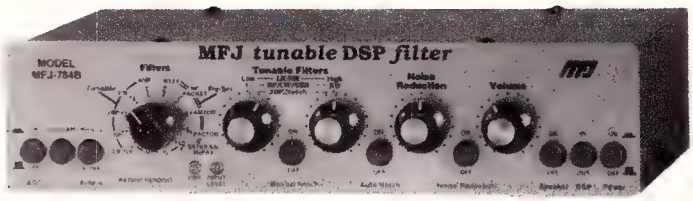
MFJ's *tunable* super DSP filter automatic- eliminates heterodynes, reduces noise and erference *simultaneously* on SSB, AM, CW, ket, AMTOR, PACTOR, RTTY, SSTV, FAX, FAX, weak signal VHF, EME, satellite. You get MFJ's *tunable* FIR linear phase ers that minimize ringing, prevent data ors and have "brick wall" filter response h up to 57dB attenuation 75 Hz away. *Only* MFJ gives you 5 *tunable* DSP filters. n can *tune* each lowpass, highpass, notch, l bandpass filter including optimized SSB l CW filters. You can *vary* the bandwidth to point and eliminate interference. *Only* MFJ gives you 5 *factory* pre-set filters l 10 *programmable* pre-set filters that you customize. Instantly remove QRM with a n of a switch! MFJ's *automatic notch* filter searches for l eliminates *multiple* heterodynes. You also get MFJ's advanced *adaptive noise uction*. It silences background noise and N so much that SSB signals sound like FM. The *automatic* notch and *adaptive* noise uction can be used with *all* relevant tunable -set filters. *Automatic gain control* (AGC) keeps audio el constant during signal fade.

U.S. Patent D374,010

MFJ-784B

$249.95

NEW!



Tunable bandpass filters

Narrow band signals like CW and RTTY jump of QRM when you switch in MFJ's exclusive *able* FIR bandpass filters.

You can tune the center frequency from 300 to 00 Hz, and vary the bandwidth from 30 Hz to 00 Hz -- from super-tight CW filters to wide or-sharp Data filters.

You can use two tunable filters together. For mple, tune one to mark, one to space and set dwidth tight for a super sharp RTTY filter.

Tunable highpass/lowpass filters

You can tune the lower cutoff frequency 200 to 00 Hz and the upper cutoff frequency 1400 to 3400 Hz. This lets you create *custom* filters for Voice, Data and other modes.

Signals just 75 Hz away literally disappear -- they are reduced 57 dB!

Automatic notch filter

MFJ's automatic notch filter searches for and eliminates multiple heterodynes in milli-seconds. It's so fast, that even *interfering* CW and RTTY signals can also be eliminated.

You can *selectively* remove unwanted tones using the two *manually tunable* notch filters --an MFJ exclusive. Knock out unwanted CW stations while you're on CW.

Adaptive Noise Reduction

Noise reduction works in all filter modes and on all random noise -- white noise, static, impulse, ignition noise, power line noise, hiss.

The LMS algorithm gives you up to 20 dB of noise reduction. Noise reduction is adjustable to prevent signal distortion.

15 *pre-set* filters -- factory set or you custom program

You can select from 15 *pre-set* filters. Use for SSB, AM, CW, packet, AMTOR, PACTOR, RTTY, SSTV, WeFAX, FAX or any mode.

If you don't like our pre-set filters, you can program your own -- *an MFJ exclusive!* Save center frequency/bandwidth, lowpass/highpass cutoffs, auto/manual notch, noise reduction -- all filter settings -- in 10 *programmable* filters.

Plus more . . .

A push-button bypasses your filter -- lets you hear the *entire* unfiltered signal.

2½ watt amplifier, volume control, input level control, speaker jack, PTT sense line, line level output. 9½x2½x6 inches.

Plugs between your transceiver or receiver and external speaker or headphones. Use 12 VDC or 110 VAC with MFJ-1315, $14.95. Cable Pack, MFJ-5184, $7.95, includes receiver cable, DC cable, 2 open-end TNC cables.

New Features

MFJ's exclusive tunable *Spotting Tone*™ -- accurately tunes even the narrowest CW filter.

MFJ's exclusive *Adaptive Tuning*™ -- tuning rate automatically becomes finer as you narrow bandwidth -- makes narrow filters easy-to-use.

MFJ's exclusive *FilterTalk*™ -- sends precise filter settings in Morse code.

Has automatic notch with *variable* aggressiveness, new quieter 2½ watt audio amplifier, new speaker switch keeps phones always active.

Manual and automatic notch can be used together. Noise reduction, automatic notch and tunable manual notch can be used when a custom filter you saved in memory is selected.

You get an accurate easy-to-use input level indicator, improved manual notch in the CW mode, adjustable line level output, more Mark-Space frequencies and baud rates for data filters and auto- matic bypass during transmit for monitoring CW sidetone, voice or data by sensing the PTT line.

Firmware Upgrade

For MFJ-784, order **MFJ-55, $29.95.** Gives you most features of the MFJ-784B.

EW! 60 dB Null *wipes out* noise and interference

MFJ-1026

$139.95

Wipe out noise and interference *before* it gets your receiver with a 60 dB null!

Eliminate all types of noise-- severe power noise from arcing transformers and ulators, fluorescent lamps, light dimmers, ch controlled lamps, computers, TV birdies, lightning crashes from distant thunderstorms, electric drills, motors, industrial processes . . .

It's *more effective* than a noise blanker because interference much stronger than your desired signal can be completely removed without affecting your signal.

It works on *all modes* -- SSB, AM, CW, FM -- and frequencies from BCB to lower VHF.

You can null out strong QRM on top of weak rare DX and then work him! You can null out a strong local ham or AM broadcast station to prevent your receiver from overloading.

Use the MFJ-1026 as an *adjustable phasing network*. You can combine two antennas to give you various directional patterns. You can null out a strong interfering signal or peak a weak signal at a push of a button.

Easy-to-use! Plugs between transmitting antenna and transceiver. To null, adjust amplitude and phase controls for minimum S-meter reading or lowest noise. To peak, push reverse button. Use built-in active antenna or an external one. MFJ's exclusive *Constant Amplitude Phase Control*™ makes nulling easy.

RF sense T/R switch automatically bypasses your transceiver when you transmit. Adjustable delay time. Uses 12 VDC or 110 VAC with MFJ-1312B, $12.95. 6½x1½x6¼ inches.

MFJ-1025, $119.95. Like MFJ-1026 less built-in active antenna, use external antenna.

d DSP to *any* Multimode

-781

9.95

Add "brick wall" DSP filtering to *any* TNC or multi-mode data controller.

Copy signals buried in noise and QRM.

Under severe QRM, DSP greatly improves copy of Packet, AMTOR, PACTOR, R, Clover, RTTY, SSTV, WeFAX, FAX, - nearly any digital mode. Automatic gain ol, ON/OFF/Bypass switch. Plugs between ceiver and multi-mode. Uses 10-16 VDC or VAC with MFJ-1312B, $12.95. 4½x2½x5in.

DSP for *your* MFJ-1278/B

MFJ-780

$99.95

Plug a MFJ-780 "brick wall" DSP filter into your MFJ-1278/B multi-mode and you won't believe your eyes when you see solid copy from signals completely buried in QRM! MFJ-1278/B *automatically* selects the correct DSP filter for Packet, AMTOR, Pactor, RTTY, ASCII, FAX, Color SSTV, Navtex or CW.

Plug in a MFJ-780 and copy signals that other multi-modes can't. Some soldering needed.

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NORTHERN NEW JERSEY: SM, Roy H. Edwards, Sr, KB2LUO—ACC: N2NKF. PIC: N2FM. SEC: KB2WNZ. SGL: AA2TW. STM: WB2FTX. By the time you read this, KB2LUO will be your new Section Manager. But due to *QST*'s "lead time," this column is being written by outgoing SM W2VU (until recently, NW2L). This is my 94th and final Section News column, stretching back to the middle of 1989. I have enjoyed the privilege of serving as your SM for these past eight years, and to have been part of some significant achievements, including reform of the state scanner law and successfully battling to prevent the Dept. of Environmental Protection from taxing our antennas. I thoroughly enjoyed every club meeting I visited, every hamfest I attended and, well, most of the phone calls I received. I would like to thank each and every League member who helped make the past eight years so enjoyable and successful, and especially those who helped out as section leadership officials. Thank you all for a job well done. As you see from the list at the top of the column, Roy is in the process of forming his own section leadership team. Dave Struebel, WB2FTX, is staying on as Section Traffic Manager; Paul Toth, KB2WNZ, moves up from DEC/Skywarn and Public Information Coordinator (PIC) to Section Emergency Coordinator. Taking Paul's place as PIC is Michael Karp, N2FM, who has been CJRA's very successful PIO. Vivian Lopez, AA2TW, becomes State Govt Liaison, and finally (so far), Sussex County's Dawn Ann Payne, N2NKF, takes over as Affiliated Club Coordinator. I know all of these people and think they'll do a fine job. Please support them. I'm sure Roy will have more announcements next month as he fills out his section cabinet. Again, vy tnx to all. It's been a great eight years. Traffic news: Net activity for March (QNI=# of checkins; QTC=# of messages passed):

Net	*Mgr*	*Time*	*Freq*	*Sess*	*QNI*	*QTC*
NJM	WA2OPY	1000	3695	31	226	119
NJPN	W2CC	1800	3950	36	249	32
NJSN	AA2HJ	1830	3715	29	136	10
NJN/E	AG2R	1900	3695	31	257	121
NJN/L	WA2SEI	2200	3695	31	73	18
CJTN	N2VQA	2000	147.120	31	565	91
NJVN/E	N2ZKJ	1930	146.895	31	571	75
NJVN/L	N2OPJ	2230	146.490	31	292	74

March traffic (call sign/# message pts./PSHR points): W2MTO/139/109, KE2JX/136/125, N2XJ/134/134, N2OPJ/123/149, N2FM/85/114, WA2SEI/84/190, N2OWN/67/152, N2VQA/63/128, N2RPI/54/163, KB2LUO/ 37/152, WB2CZW/29/135 N3RB/29/100, W2CC/22/83, W2JG/19/71, KB2OPJ/16/86, N2GJ/13/122, N2SU/10/72, N2QAE/8/- KC2ANQ/7/108 W2VX/5/-. Vy 73 de W2VU. Please give Roy your full support.

MIDWEST DIVISION

IOWA: SM, Jim Lasley, NØJL @ KEØBX—ASM: NØLDD. SEC: NAØR. STM: KØCNM @ KØCNM. ACC: NØIJP @ KEØBX. BM: KØIIR @ WAØRJT. SGL: WRØG. TC: WØDIA. PIC: WØZPM. OOC: NØLOH. TIDXC has gone electronic with their newsletter. I expect others to do the same. As long as I (and the members!) have access to e-mail, that is fine, but I only have it because of my position. Fort Madison club has a fella who recently passed both the 13 and 20 WPM code. Now he has to pass the theory! How often does that happen? There is a nice article by Dave, WAØAUQ, on tuning FM radios in the SEITS journal. Been a long time, Dave. The HAWKNET is also explained. Check with KEØBX. CAARC is building membership and working hard giving exams in the Centerville area. Calhoun County is working on SET. IIARC is working with the FEMA folks. Way to go, gang! Sorry to note the loss of NØYYP, WAØDMM, and KØGUF in the last few weeks. They are missed. Several groups are noting that RAGBRAI is coming to town. Looks like it is pretty well organized from our standpoint. FMARC has an interesting article concerning a JARL code skill award with rankings similar to those in Judo or Karate. ARCS sent a very slick paper that shows what you can do with a computer and a nice color printer. Nice picture of WØSVD and some fine Collins gear and KAØVSL and just some fine old gear. CVARC has a nice article on building a paddle for portable use. The SARA has a very nice tribute to KØTFT. I found the comments by KUØA in the ICARC letter to be both enlightening and significant. That's a wrap. Newsletters were received from TIDXC, FMARC, SEITS, CAARC, CCARC, IIARC, DRAC, DMRAA, ICARC, CIRAS, SARA, SIRA, MPARC, CVARC, ARCS. Tfc: WØSS 140, KAØADF 97, WBØAVW 42, NRØE 37, NØJL 35, KØCNM 24.

KANSAS: SM, Mike Brungardt, KØTQ—SEC: WDØDMV. STM/ASM: WØOYH. ACC/OCC: KØBXF. SGL: AAØGL. Once again I want to wish all good luck with your Field Day event. I am hoping to be able to visit a few other clubs this year during FD weekend if the operating sked permits at our operation. I enjoyed the PHD hamfest, our section meeting of ECs and DECs, of which I hope to have more section meetings as time and schedules allow. I hope some of you had the opportunity like I to attend the Dayton hambash, my second time and had a great time. During our storm season if your RACES/ARES group activates, please take a few minutes to report this activity to Joe, WDØDMV, for our records and section reporting. It is being proposed to the FCC that the RACES/ARES rules be relaxed somewhat to allow operators to communicate with other operators which may not be of the same group. These kind of changes need to occur as times and practices change. I'd like to suggest to everyone that it's very important this time of year to keep your emergency supplies, radios, batteries, etc. ready to go with a moment's notice. The Kansas RACES statewide net meets the first Thursday of each month on 3940 kHz. Please QNI with Joe and let your county be heard. Please notice the Chisholm Trail special event operation in this issue. Feb SEC report 371 QNI 4 QTC STNS NØZGZ, KBØFAX, NØLJK, NØKOJ, KGØHN, NØUXG, WDØDDG, AAØIQ, WDØDMV. TEN for Feb 219 msgs, 56 sessions, KS 86% with AAØFO, KXØI, WBØLKA, KØPY, KØTQ, NBØZ, WBØZNY, Dave, WØSS TEN mgr. OBS stn WØOYH, sent/rec 18 = 36 W1AW bulletins for distribution, Orlan, WØOYH. Tfc: AAØOM 1005, NØKJ 570, WØOYH 130, WBØZNY 126, KØTQ 68, NBØZ 28, WØFT 22, KBØDTI 21, KXØI 18.

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MFJ-418 gives you a large LCD display that reads out letters, numbers and punctuation in *plain English*. See code as it is being sent!

MFJ's proven *Beginner's Course* takes you from zero code speed to solid copy *fast!*

Realistic plain English QSO practice helps you pass your FCC code exam.

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Practice copying words as *one sound* -- not individual characters. Instant word recognition makes you a true, high-speed CW pro.

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MFJ's interactive mode lets *you* set the pace -- *you* decide when to copy the next group and how many -- *not the tutor.*

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QST rate MFJ tutors *"the clear choice for beginners"*. Follows ARRL/VEC format.

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Practice copying and then replay to instantly check your copy on the LCD display.

Custom Character Sets

If you have trouble with certain characters, you can *build and save* a custom set of these for extra practice -- *an MFJ exclusive.*

Realistic Plain English QSOs

You can practice copying *realistic* on-the-air style plain English random QSOs.

They'll help get you ready for your FCC exam. When you're comfortable copying these QSOs, you're ready to pass and upgrade!

They'll also give you plenty of confidence before you make your first *real* contact.

MFJ's *CodeTest*™ set lets you practice *only* the characters required on FCC exams.

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MFJ's *Word Recognition Mode*™ gives you hundreds of commonly used words in amateur radio. Practice recognizing *entire words* instead of individual letters.

Learn to copy words without writing it down and carry on an entire CW conversation without paper -- just like pros on 40 Meter CW.

You can save 10 words of *your choice* for word recognition practice -- *an MFJ exclusive.*

You'll never run out of practice

Select letter, number, punctuation, prosign or code test sets, random call signs, random words, QSOs or combination sets for practice -- you'll never run out of study material.

NEW!

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You can even make up and save your own word and character sets for practice.

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MFJ InteractiveMode™ lets *you* decide when to copy the next or previous group and how many -- great for beginners.

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Select normal or Farnsworth spacing.

Farnsworth makes it easier to recognize entire characters. It stops the tendency to count individual dots and dashes that slows learning.

Farnsworth character speed is adjustable 10 to 60 words-per-minute for high-speed practice.

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Use fixed length or more realistic random length groups. Up to 8 characters per group.

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Change speed on the fly while you're playing a session -- 3 to 55 words-per-minute.

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Choose from easy-to-use menus on LCD display. Simple 3 button operation.

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Your settings are *automatically* saved, ready to use next time -- no more #$%* resets!

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Read words, letters, numbers and punctuations in *plain English* as code is being sent. It's a powerful sound and sight aid!

Check your copy, select from menus and program custom characters and words.

LCD has 2 lines and 32 *huge* 1/4" high-contrast characters.

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Only MFJ gives you *SilkySmooth Sidetone*™ with *TruTone*™ sinewave and *SoftStart*™ dots/dashes -- lets you concentrate on learning without the distraction of harsh keyclicks. Use earphones for private practice or built-in speaker for groups.

Adjustable volume. Loud, powerful audio amplifer.Variable pitch 300-1000Hz.

Pocket Size

Fits in shirt pocket with room to spare!

Smaller *than a pack of cigarettes* -- tiny 2 1/4x3 3/4x1 in., weighs less than 5 1/2 oz.

Toss it in your briefcase, travel bag or stash in your car's glove compartment and you'll always have it ready for instant practice.

Uses 9 volt battery. Not included.

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Tapes play the same old boring stuff over and over again. Unlike tapes, you'll never memorize the MFJ-418 random code sessions.

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Enjoy more ham band privileges -- learn Morse code and upgrade! *Order yours today!*

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$24.95

Learn to send Morse code with MFJ-557. Straight key with adjustable travel and tension, and built-in speaker with volume and tone controls lets you practice to your heart's content. Earphone jack. Heavy non-skid steel base stays put as you tap out Morse code. Use 9V battery or 110 VAC with MFJ-1305, $12.95.

MFJ-550, $7.95, telegraph key only.

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MFJ-714

$59.95

Intermod causing squeaks, squawks, unidentified voices and other noises all across the 2 Meter band? Can't use your radio?

MFJ *IntermodFighter*™ eliminates intermod by reducing interference up to 50 dB with three high-Q bandpass filters. Plugs between radio and antenna.

MFJ-713, $59.95. For handhelds, has BNC connectors. Uses 9V battery. **MFJ-714, $59.95.** For mobile rigs, has SO-239 connectors. Uses 12VDC.

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MFJ-116, $14.95. ID buzz every 10 minutes. Big 5/8" red LED digits. Loud/soft alarm. Uses 110 VAC. 9V battery backup. 4 1/2x2x4 inches.

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MISSOURI: SM, Roger Volk, KØGOB—We have a new sweetheart in the Section. She is eight year old Rebecca, KBØVVT. At the Ararat Hambash she passed her Amateur Extra license. By the way, her mom and dad also passed their Amateur Extra exams on the same day. Congratulations to all! The Hambash was well attended and I thank everyone for stopping by for a "hall" conversation. That's an inside joke and you will only get it if you were there. If an emergency occurred in your area, how would your club notify members and/or non-members that their help was needed? The St. Louis Amateur Radio Club (SLARC) has had a dual phone tree in place for many years for just such events. You might consider establishing a similar procedure. Remember, advance preparation is the best solution to an emergency. I don't usually plug up-coming events, but members of the MO Section are in an excellent position to see, first hand, the Sunrayce '97 solar car race. The cars are designed, built and driven by students from some 60 universities and will be in the state from June 21 to 24 inclusive. Special event station KBØSYC will operate on 14.260 and 28.325 each day during the race, and on 2 mtrs after the race each day. Test results from the Central States VHF convention, showed that the 432 MHz preamp with the highest gain and lowest noise figure was submitted by Bob, NØIS from St. Louis. Nice work! Per the MDARC newsletter, the first sign of spring is the call for amateurs to provide communications support for various charity events. If every ham participated in one event, there would be no shortage of operators. Nets: MOTRAN 31/809/221 KØIPM; STLRPTR 5/148/7 KØWEX; PAULREVERE 5/635/0 NØIWA; QCWA35 4/102/1 KØYML; HAMBUTCHERS 21/827/57 KØDSQ; MON1&2 62/154/134 WØOTF; AUDRAINARES 4/38/3 WBØSEN; CMEN 4/30/0 NØFPE; CARL 3/28/1 KCØMV; ROLLABB 31/398/10 NAØV; MIDMOARC 4/52/0 KBØYGY; HAARC 4/202/1 NØYLF; KCABARC 4/151/4 NØIWA; SWMOWARN 4/150/5 KGØIV; WJACKCOARES 7/64/1 KØUAA; WAARCI 5/129/0 WEØG. Tfc: N3PGG 1255, KEØAH 293, WØOTF 108, WAØYJX 90, AAØWJ 16.

NEBRASKA: SM, Bill McCollum, KEØXQ—ASMs: WØKVM, NØMT, WBØULH, WYØF & WBØYWO. It is with deep regret to inform you of the passing of Dean, KAØKPT. Dean was a well-known traffic handler. He became a Silent Key on January 18. Congratulations to Leo, WØGFQ, of Omaha, for being named the 1997 Dayton Hamvention Amateur of the Year. He is best known as being the founder of World Radio Labs. On Saturday April 5th, 75 amateurs assisted the Douglas & Sarpy County Civil Defense agencies in the checking for proper operation of tornado sirens. CD authorities were quite impressed with number of amateurs participating. Many amateurs across the state have been attending Tornado Spotter training conducted by the NWS. The Saline County repeater is back on the air and the ARES net meets every Tuesday evening at 2000 on 146.985. Members of Lancaster County ARES participated in a disaster drill conducted by the Red Cross. NØVAX, of Minatare, has been appointed as EC for Scottsbluff County. He also serves as the DEC for Western Nebraska. Net Reports: NCHN, QNI 544, QTC 25 & 31 sessions. Dodge ARES: QNI 56, QTC 3 & 4 sessions. MID NE ARES: QNI 398, QTC 2, 31 sessions & 1 WX training net with QNI of 10. NE Storm Net: QNI 841, QTC 48 & 31 sessions. Tfc: KØPTK 71, WØAP 57, KEØXQ 15, WYØF 4, KFØMS 2, WØEXK 2, WCØO 2.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Betsey Doane, K1EIC—ASMs: KZ1Z, KB1H, NK1J, K1STM, N1API. ACC: WA1CBW. BM: KD1YV. OOC: W1FAI. PIC: W1FXQ. SEC: NI1U. SGL: K1AH. STM: K1HEJ. TC: KA1KJZ. Traffic handlers who attended the annual dinner in Plainville had a wonderful time although it was a much smaller group than usual. We all sat at tables configured in a large square, which made it very nice for some good discussion. Updating our training in the art of disciplined communications skills was a topic of concern to the group. Dan, KY1F, agreed to coordinate this activity so keep your ears open for more word on opportunities for sharpening your skills. There was a nice crowd at The Southington Flea Market—it's always nice to have the chance to see so many of you! SEC Clark, NI1U, held an ARES meeting at the flea market where he gave out several emergency communications commendations. This certificate was awarded to the following ARES members for their outstanding work: Mike, N1QNQ, Phil, KA1YIQ, Dave, N1INH, Lenny, N1PTG, Gary, KD1RJ, Dixie, KD1UK, Andy, N1RWG, Harvey, K1PZS, Roger, K1PAI, Ed, WA1UJT and Rick, N1JTB. Congratulations to you all! Dixie, KD1UK, was sure busy and a bit surprised during our last storm in March. You have no doubt heard about how Litchfield County was affected. But her SKYWARN ops were there ready to help operating simplex with good liaisons to other areas ready to spread the word. Mark your calendar for the Northern Berkshire ARC ham fest June 21—why not take a ride to that area of the section! Ken, N1RGK, is coordinating the Amateur Radio communications effort at the Hartford Marathon October 19. He is looking for clubs or groups of people who would be responsible for handling a few miles of the race. Of course, each group would be given direction as to how to proceed. This is a big effort folks and promises to be a lot of fun. Groups interested should contact Ken as soon as possible. Finally, get set for Field Day—it'll be here sooner than you think! Net sess/QNI/QTC/NM: WESCON 31/327/162/KA1GWE; NVTN 31/242/627/K1STM; RTN 31/284/81/WA1FCA; CPN 31/279/ 71/N1DIO; CN 28/88/28/N1AEH; FRN, 100% participation from CT. Tfc: NM1K 1856, KA1VEC 527, KA1GWE 323, N1VXP 184, WA4QXT 108, K1STM 71, K1HEJ 58, KE1AI 29, N1PNT 23.

MAINE: SM, Michelle Mann, W1GU—ASMs WA1YNZ & KA1TKS. STM: NX1A. BM: W1JTH. TC: NS1Z. SEC: KA1LPW. SGL: W1AO. ACC: KA1RFD. OOC: KA1WRC. PIC: KD1OW. Asst. Dirs. W1KX, KA1TKS, K1NIT. Regret to report Silent Keys WA1CQL and W1VY. They will be missed. Great to see everyone at the Portland Hamfest yesterday. The PAWA did a great job, as usual. Many thanks to George Caswell, W1ME, who came to the rescue when W1KX and I got stuck on the turnpike after the hamfest (after W1KX forgot to put gas in the car). Also thanks to the other helpful folks on the 147.09 repeater when I called in looking for assistance. George bought the gas as well as the container to put it in, drove out of his way to get to us, then refused any reimbursement. Now there's a real ham!

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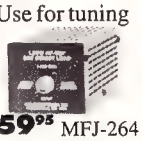

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Hope to see everyone again at the Bangor Hamfest at Hermon High School on June 14, sponsored by the Pine State ARC. Also at the Clinton Hamfest on July 19 at the Clinton Fairgrounds, sponsored by the Maine Council of Amateur Radio Clubs. Welcome to new Official Observer Coordinator Ken Gadway, KA1WRC. He can be contacted by mail at RR 1 Box 666, Harrison, ME 04040, by phone at 583-6524 (home) or 583-6332 (work), e-mail at mcs@megalink.com. March traffic: W1KX 106, NX1A 87, AF1L 47, W1GU 47, W1JTH 40, AA1KC 36, W1CE 34, N1WL 25, NR1W 25, KA1RFD 9, KA2ZKM 19, N1NFK 18, N1HYF 15, WA1YNZ 9. 73 de Michelle.

NEW HAMPSHIRE: SM, Al Shuman, N1FIK (BBS@WA1WOK)—ASMs: WB1ASL, W1NH, N3CLZ, W1JS, N1FIL, N1KIM. STM: WA1JVV.ACC: NA1E. BM: KH6GR. OOC: W1GTA. SGL: K1KM SEC: N3CLZ. TC: W1JY. We have collected over 150 names toward the 300 required to bring ham specialty auto plates to NH. Please consider signing on so we may get to the next level of negotiations with the state. Thanks to Anne Mac Cord, KA1RCA, for her help in rounding up people up to support the plate issue at the Hudson Flea. I hope to get more names at Hosstraders. CVFMA will hold their 7th annual hamfest on June 7th, 8 AM-3 PM, at the Goshen-Lempster School Rt-10, 10 mi. south of Newport, 25 mi. north of Keene. Activities: Test session, demos, etc. TI-146.76 MHz. Contact WB1GXM at 603-543-1389. As a reminder, there will be no NE Div. Convention in Manchester, NH, this year. QSO Party results are as follows: CVRC won in the NHARA Large Club category, CCDX won the Small Club category. Single Op. High Power Ray Faucher, KB1SO, 143,325 pts, Single Op. Low Power Tom Mangels, 13,416 pts. QRP category Tom Doubek, AA1CA, 3036 pts. Hope to see you at one of the Field Day sites. Give your local club a try. Lastly, The NH ARES program is in need of fresh blood. If you are interested in ARES, call me or Gary, N3CLZ. 73, Al.

RHODE ISLAND: SM, Rick Fairweather, K1KYI— e-mail: K1KYI@KA1RCI.RI.USA—ASM: N1JFY. ACC: AA1CE. STM: WA1CSO. OOC: WA1ZFS. SEC: N1JMA. TC: KA1EGY. BM: KA1BNO. SGL: NN1K. Providence Radio Assn's 75th ARRL anniversary dinner in Warwick drew a large crowd including ARRL's Exec VP, K1ZZ; New England Div. V. Dir, KA1T; and yours truly. Well known contester W3LPL (formerly K1LPL and PRA member) came up from Maryland for the event. I had the honor of presenting the PRA with a certificate representing their 75th year of affiliation with the League. The club presented the ARRL officials with a beautiful desk pen with the club's logo and pin attached. The food was outstanding (thanks to Johnson & Wales University staff) and the club had tables set up with memorabilia such as old *QST* magazines, photos of club activities, an equipment table with a KWM-1, which is still in service at W1OP, proclamations from Mayor Cianci, Governor Almond, and the congressional delegation from RI. Pres. WA1UMU served as MC with W1GS giving a presentation about some events in the club's history and K1DS giving a guided tour slide show of the club house at W1OP. Tfc: KA1JXH 129, K1TPK 69, WA1CSO 33, K1KYI 7. PSHR: KA1JXH 161, K1TPK 116, WA1CSO 95.

VERMONT: SM, Justin Barton, WA1ITZ—ACARA Home Page at http://www.sover.net/~lblades courtesy of Les Blades, W1UT, and Frank Dorr, N1LXH. TS Mike Seguin, N1JEZ, busy with St. Johnsbury Academy repeater (147.27+) and DVR card performing lawlessly also working with Beau Bushor, N1MJD, on the RS satellite. TC Bob DeVarney, WE1U, cured intermod problem on BARC 146.610 repeater and creating SKYWARN contact list for Northern Vermont Chapter of the Red Cross. TSRC newsletter on http://www.sover.net/~opus/index.html. SEC Joe Armstrong, KA1YLN, giving ARES presentations at ACARA, Twin State ARC and CVARC. STM, Ed Bort report: (session/checkins/traffic): VTNH 31/190/99; VPEN 5/51/6; GMN 26/908/36; Tri State FM 4/61/3. PSHR: KT1Q 142, N1DHT 109. Traffic: KT1Q 394, N1DHT 258. Burlington ARC continuing to run free weekend licensing class contact Ralph Stetson, KD1R or Mark Allard, N1IAK. Everything you wanted to know about radios from Antique to Zepps: http://www.i2.i-2000.com/~ednelson/ham-www.html.ess/Chte f

WESTERN MASSACHUSETTS: SM, William C. Voedisch, W1UD, w1ud@juno.com—ASM: N1LZC: ASM (Digital): KD1SM. STM: W1SJV. SEC: K1VSG. OOC: WT1W. As a follow up from last month's column, I hope all clubs in the section have selected their emergency committee. If you have e-mail capability, drop me a line. I am trying to compile a file of those that do. Just in case I need to make contact with someone in your town. It will help if there is an emergency. The address will not be distributed if you don't want it to be. I would appreciate it if you would contact a fellow ham that might not be a member of the League and give him this message. Of course, encourage him to join the League. CMARA will be active on Field Day with Jim, KE1HF, and Marty, W1EPH, co-chairing the event. The new repeater for CMARA is being worked on by Eric, N1NVX, and Bob, K1SF. From the info in *Ham Chatter*, that should be a going machine. KA1RPR was presented a "Certificate of Excellence" by his buddies. These little things make for great camaraderie. The "Switch.Worcester.Ampr.Org" using TCP/ip is making great headway under the able direction of N1MPY. Join us Sunday morning on 3942 kHz for the WMA Emergency Net. Tfc: W1ZPB 38, N1MUV 9, N1ISB 16, N1VMJ 82, KD1XP 26, KD1SM 17, W1SJV 34, W1UD 137.

NORTHWESTERN DIVISION

EASTERN WASHINGTON: SM, Kyle Pugh, KA7CSP—SEC: WA5ZAY. STM: W7GB. OOC: KB7HDX. SGL: WB7UEU. TC: N7TOF. BM: AB7HB. ACC: KA2LCC. STM: Don, W7GB, reported that in April the WA Amateur Radio Traffic Net (WARTS), which is a phone net, is back at its regular daily time at 6 PM. The WA State Net, a CW traffic net, is daily at 6:45 PM, both times until further notice. Remember the WA Emergency Net (WEN) is on Mondays at 6:30 PM and Saturday at 9 AM on 3987 kHz. The annual WARTS picnic is on July 13, location tba. The Wenatchee hamfest is May 31-June 1 in Dryden, WA. The Rathdrum, ID, hamfest is June 7. The Seaside, OR, hamfest and Northwest Division Convention is June 13-15; Director Brown, NM7N, said Steve Mendelsohn, W2ML, will be here and speak at the ARRL forum. All appointees are urged to attend. There are a number of problems and concerns relat-

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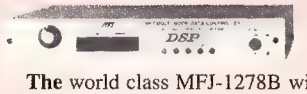

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Radios \ TNC Type	All MFJ TNCs and Multimodes	KAM VHF[5]/ KAM HF[6]/ KPC3[7]/ KPC9612[5]	PK-232	PK900/PK96/ PK12/DSP232 /PacComm/ other TNC-2 compatibles
Alinco[9]/Stdrd HT	MFJ-5022	MFJ-5022YV	MFJ-5022X	MFJ-5022
Icom[1]/Yaesu/ Radio ShackHTs	MFJ-5024	MFJ-5024YV	MFJ-5024X	MFJ-5024B
Kenwood[2] HTs	MFJ-5026	MFJ-5026YV	MFJ-5026X	MFJ-5026
Yaesu 8-pin	MFJ-5080	MFJ-5080YV MFJ-5080YH	MFJ-5080X	MFJ-5080Z
Icom[3] 8-pin	MFJ-5084	MFJ-5084YV MFJ-5084YH	MFJ-5084X	MFJ-5084Z
Kenwood/Alinco 8-pin	MFJ-5086	MFJ-5086YV MFJ-5086YH	MFJ-5086X	MFJ-5086Z
Yaesu 8-pin modular	MFJ-5080M	MFJ-5080MYV	MFJ-5080MX	MFJ-5080MZ
Icom[4] 8-pin modular	MFJ-5084M	MFJ-5084MYV	MFJ-5084MX	MFJ-5084MZ
Kenwood 8-pin modular	MFJ-5086	MFJ-5086MYV	MFJ-5086MX	MFJ-5086MZ
Radio Shack 8-pin modular	MFJ-5088M	MFJ-5088MYV	MFJ-5088MX	MFJ-5088MZ

1. does not include IC-W2A
2. does not include 2500
3. does not include 25A, 255A
4. does not include IC-100H, IC-2700H
5. YV for KAM VHF port, YH for KAM HF port. Other Kantronics use YV models
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ing to Amateur Radio to discuss. March WARTS net report: checkins 2732, traffic: 193, sessions 31. WSN: checkins: 768, traffic: 768, sess 93. Tfc: W7GB, 259, K7GXZ 210, W7UVP 119, KA7EKL 79, K7BBFL 54, KK7T 30. PSHR: W7GB 138, K7GXZ 120, W7UVP 84.

IDAHO: SM, Mike Langrell, AA7VR—STM: W7GHT. Brian Mahaffy, N6UGP, is stepping down as the district 6 emergency coordinator. I had the privilege of working with Brian on several emergencies locally and he always represented the membership with high degree of professionalism. He will be spending his well-deserved time off with his family and we appreciate the time he was able to contribute to the disaster service communications group as our leader. Mike Hardcastle, KB7TRJ, is stepping down as the membership coordinator for the DSC group so he can pursue the weather service liaison position with DSC and continue his fine efforts on the DSC Web page. If you have not seen our DSC group Web page, you can find it at netnow.micron.net/~dscweb/. Please send me any section news you might want put in this column.Thanks. 73s, Mike, AA7VR. Tfc: to W7GHT 216, WB7VYH 69, KB7GZU 46, N7MPS 14. PSHR: W7KDB 142, W7GHT 120, WB7VYH 96, N7MPS 69. Net Sess/QNI/QTC/Mgr: FARM 31/2464/47/N7EZQ; NWTN 31/2371/91/N7LMA; IDACD 22/669/30/K7UBC; IMN 31/309/138/WB7VYH.

MONTANA: SM, Darrell Thomas, N7KOR—It was a pleasure to attend the 61st annual installation of officers at the Butte Amateur Radio Club. The group held a very nice dinner on March 20th to install their officers and provide an opportunity for their members to have a pleasant evening to socialize. Upcoming events for the section include a hamfest and swapmeet in Miles City on May 4th. This will be the first such event sponsored by the Southeast Montana Amateur Radio Club. A suggestion has been made to combine the WIMU Hamfest with the Glacier/Waterton Hamfest and ARRL State Convention on 18-20 July at Three Forks Campground. WIMU is an annual event that rotates between Wyoming, Idaho, Montana and Utah each year. The event is usually held in August. Those who normally attend WIMU should watch for future announcements concerning this year's event. Congratulations to Bill Kornec, KC7CIS, of Lincoln, MT, on his recent appointment as State RACES officer. Bill has been a very active member of the Section and will be a great asset to the RACES organization. Net/QNI/QTC/NM: MSN/171/0 W7OW; MTN/1998/101 N7AIK; IMN/309/138 WB7VYH. March traffic KA7YYR 371. PSHR: KA7YYR 124.

OREGON: SM, Randy Stimson, KZ7T—ASM: W7FBP. ASM: KF7KE. ASM: KG7OK. ASM: Ken, N7QQU. STM: W7VSE. SEC: WB7NML. PIO: KC7YN. SGL: KA7KSK. ACC: AA7OA. STC: N7HMV. OOC: NB7J. US West long distance telephone system failed in Clatsop Co during the bad weather and the hams stepped in and kept the 911 system working. The radio relays had local access to the 911, but nothing for out of county. The hams linked Columbia Co, Claskanine Fire and Rescue, Vernonia, Vancouver, WA, South Seaside, Westport, Tillamook Co and Multnomah Co. There was a ham in the Columbia Memorial Hospital. The hams also provided point to point contact with Emanual Life Flight operations in Portland. I don't have the names of all the hams but Marque, N7LWQ, took on the responsibility of setting it up. Great job people. I see where Lane County ARC had a straight key contest. There were eleven participants, but the outstanding fist belongs to Jack, W7NTI. The runners up were Harry, W7ILY, Phil, W7BFX, May, W7PIO, and Sam, KA7EAT. Don't forget the SEAPAC Convention this June 13 and 14. Also July 19, the Coos County Hamfair and August 10, the Bend Ham Radio and Computer Fest. Tfc: N7UOF 483, W7VSE 143, W7WAT 143, K6AGD 111, W7ODG 96, K7NLM 47 and KA7AID 40. My BBS is K7IQI.

WESTERN WASHINGTON: SM, Harry Lewis, W7JWJ—Sometimes county reports could fill several columns such as this, but each report must be edited to a few words. After striking all unnecessary words, it comes out like this: Snohomish County ARES you're the tops! Your flood work has not gone unnoticed. This month we will report on Medical Services via DEC Marina, N7LSL, who says, "There has been a significant amount of recovery and mitigation activity following the winter storm, which caused many serious problems for the health care system. Consequently, both the Hospital Association and Health Department in King County have been holding a lot of planning meetings that I have attended... I'll be attending a number of the FEMA-EMI Professional Development Series courses in the next few months. Thurston County EC for Medical Services, Dave LeFevre, KC7FEC, has been meeting with a Thurston County committee working on various emergency preparedness concerns in Thurston, including Amateur Radio. He has also been trying to locate a repeater site in South Puget Sound area for another W7SRZ 440 repeater to tie into the existing system. There are lots of creative ideas floating around, but not implemented yet, so not ready to talk about them. "King County ARES meets the first Monday evening of each month at the Red Cross building located in the Rainer Valley, South Seattle. If you are interested in emergency communications or an ARES appointment drop on by and sit in on one of these meetings. Individual traffic: K7BDU 846, K7CLL 9, KB7JQM 300, W7LG 72, KG7LS 33, KD7ME 135, W7NWP34, W7PFD 20, K7SUQ 15, KA7TTY 30, W7TVA 172, W7VNT 5, W7ZIW 229. Net traffic/Manager: NTN 392/W7TVA, WARTS 193/W7GB, WSN 323/W7ZIW, CCAIN 4/K7SUQ, PSTS 16/KA7TTY. All traffic nets liaison to RN7.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF WB3FCV. SEC: N4OGL. DECs: WD6CJK/Alameda County, KO6JR/Contra Costa County, WA7IND/Napa County, K6USW/Solano County, N6UOW/Training, KE6HCI/Administration, KE6NVU/Finance, W6CPO/Technical Services. STM: K6APW. OOC: W6NKF. TS: KF6NY. The Alameda County Emgy Svcs (ACES) Net is held Tuesdays at 8 PM on 147.240, 444.200 (107.2), 147.120, 224.740, 441.125 (100.0) & 145.43 (100.0). All are linked for the net, and those interested in Emgy Comms are invited to check in. Check out the EB WWW Page at http://www.portal.com/~pdarrl/ebs.html. Oakland ARES welcomes new members WB6UVO, WD6CJK, & KF6EQA; and congratulates W6LL

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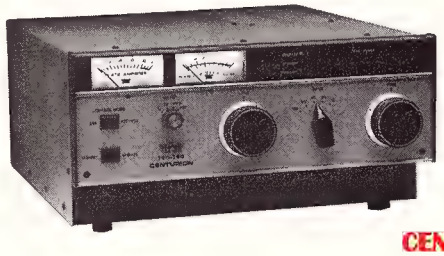

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on his new call. EMBARK set up a station at Jefferson School, in Berkeley, for the School Roundup. KD6URS, WB6IZE, & KG6FR treated first through fifth grade classes to contacts in 11 states and 2 Canadian Provinces. CCCC welcomes new members AC6GD & KF6CAO; & congratulates N6CJ & AI3X on their new calls. Recent graduates of VVRCs latest license class are KF6JAJ, KF6IZV, KF6JAL, KF6JAC, KF6JAA, KF6JAF, KF6JAH, KF6IZY, KF6JAD, KD6JAE, KF6IZW, KF6JAG, KF6IZZ, KF6JAK, KF6IZX & KF6JAB. Congrats to one and all. LARK mourns the loss of long-time member Wil Miller, K6DZU. HRC. welcomes new members WB6BGN & N6OBP. SARS is starting a spouse licensing class under the direction of WA6BIS. MDARC's WB6OFH, is planning the club's 50th anniversary celebration. March tfc: W6DOB/622, K6APW/102.PSHR: W6DOB. BPL: W6DOB. Tfc nets: NCN1/3630/7PM; NCN2-SLOW SESSION/3705/9PM; NCN-VHF/145.21/8:30PM; RN6/3655/7:45 PM & 9:30 PM; PAN/3651/7052/8:30 PM. Your check-ins are always welcome.

NEVADA: SM, Bill Smith, W4HMV (e-mail: w4hmv@arrl.org)—ASM: K7IY. TC: NW7O. SEC: N7JEH. ACC: N7FFP. STM/SGL: N7CPP. OOC: W7KLH. PIC: WW7E. Effective July 1, your new SM will be Bob Davis, K7IY, of Reno. Bob has capably served as the Assistant SM for the section for two years and is in tune with what is going on in the section. Bob's was the only petition submitted to League HQ for the election, and I believe he would have been a popular choice had there been an election. Watch your July *QST* for Bob's address & phone number. Congratulations, Bob! New Directors for WADG are: Rich Warren, N7RH; Pat Stewart, W9CI; Mike Bollman, KC7AHH & Dave Loar, WA7OWU. Las Vegas Repeater Association (LVRA) has a spiffy new Web page: www.hxo.com—check it out! ARRL members in Las Vegas gearing up to man the ARRL booth at this year's National Association of Broadcasters convention. Pacific Division Director Brad Wyatt will be visiting the LVRAC next week in conjunction with NAB convention. Southern Nevada Repeater Council met with repeater owners on April 5—SNRC officers elected were: director: Wayne Schenk K7WS, vp: Bob Woollum WB6NTP, sec/treas: Chuck Young KB7CG. (CARCON-K7WYC). Till next month, 73 de W4HMV. Tfc: N7CPP 61, K7OK 10.

PACIFIC: SM, Dean Manley, KH6B—SEC: Dennis Carvalho, KH2M. ASM: Harry Nishiyama, KH6FKG. ASM: Lee Wical, KH6BZF. SGL: Ron Phillips, AH6HN. OOC: Chuck Burch, AH6IN. TC: Kenny Bell, KH6AFQ. Please promote ARRL membership and consider volunteering your services in this ARRL section. The semi-annual meeting of the Hawaii Chapter QCWA was held March 15 at the QTH of Jim KH7M, Koloa Kauai. those attending: KH6HME, AH7A, KH7M, KH6AFQ, K6RER, WY6G, KH6S, NH6OO, KH6F and KH6B. Corky, W6ORS, returned from California again. HAARP test from Alaska received with strong signals in Hawaii on 6990 kHz. Hawaii QRP Club has been organized. Please see KH6B for details. Please consider participating in local nets: Hawaii Afternoon Net 0200 UT on 7088/3888, Pacific Interisland Net 0800 UT on 14315, Friendly Net 1900 UT on 3860, and 2 meters for local nets. Listen much and on directed nets, always follow procedures directed by the net control station. Mahalo, 73 and Aloha.

SACRAMENTO VALLEY: SM, Jettie Hill, W6RFF—Is your club or group ready for Field Day? Band conditions should be better this year, so let's make a big score. Many clubs reporting financial problems and dues increase as cost of putting out bulletins increase and meeting expenses rise also. Also there seems to be a decrease in club membership. Get out there and recruit members for your club and for the ARRL. WA6EQQ has a new Explorer and has it equipped and ready for any emergency with HF, VHF, UHF and packet facilities. North Hills RC Hamswap was well planned and did well as usual. The Emergency Response Institute was again held in Sacramento and open to amateurs as well as professional public safety people. I hope everyone sent their comments to ARRL on the proposals that were detailed on Pg 55 in March *QST*, if not get them in now. Yolo ARS still looking for a club president and have found a new meeting place at the Davis Explorit at the Science Center. SFARC had a fundraising breakfast with a transmitter "ham" hunt afterwards. BARK has cut their electric bill in half with their new repeater equipment. River City ARCS had an interesting program on Morse code, with several novel methods of transmitting the code. Also code was sent at several speeds to see who could copy it. Three vision-impaired hams upgraded recently, KE6YMZ, N9HNE and KE6YJJ went from Technician to AmateurExtra in one sitting!! Mother Lode DXCC won the club competition in the 1996 Calif. QSO Party, and are waiting for this coming October! The Singletown group are now meeting at the Palo Cedro Country Cafe. Tfc: KD6BO 230, WA6WJZ 85, KE6LW 66.

SAN FRANCISCO: SM, Tom Orman, KD6VWD—OO, ACC 415-392-5594, KD6VWD, Tom; OOC-OO 707-795-9073 KD6HQ, Donald; ASM-ORS 707-938-2626, N6KM, Kenneth; ACSI 415-453-0576, N6BNJ, Charles; CLARC, PO Box 3548, Clearlake, CA 95422; DNARC, 707-464-1685, KA6SPQ, Bill; HBARC, 707-442-1171, WD6DCG, John; LCARS, 707-994-1133, N6UZQ, Carol; LARC-GG; PO Box 14073-S.F. CA94114; MARC 415-897-4082, KK6JJ, Grant; MCARS, PO Box 1396 Ukiah, CA 95482; PDX & E, 707-762-9597, WB6VGY, Fritz; REDXA, 415-892-3144, K6ASI, William; SFARC, 415-661-5065, AB6WP, Jorge Jo; SCRA, 707-837-9434, KD6CJQ, Edmund; SHARC, PO Box 193, Garberville, CA 95542; VMARC, 707-938-0876, KD6KVY, Steve; WARC, 707-459-1871, WA6KLK, Leonard.

SAN JOAQUIN VALLEY: SM, Donald W. Costello, W7WN—ASM: Mike Siegel, KI6PR. ASM Technical: John Lee, K6YK. SEC: Ernie Rader, W5NH. OOC: Victor Magana, AA6AH. TC: William A Burns, WA6QYR. Hello all. Yes, I did change my call. The allure of the vanity call program was too much to resist. The National Weather Service in Hanford is very much interested in working with hams in the section in reporting weather conditions to them via ham radio. The NWS has installed a very nice Amateur Radio station at the office in Hanford and is looking for volunteers to man the facility on a call-up basis. In the works is the concept of utilizing repeaters and packet to report weather conditions by hams to the Hanford NWS station. The program is called SKYWARN and is very helpful to the NWS in the mid-west. There will be more news of the SKYWARN program in future Section News. Radio clubs in the section

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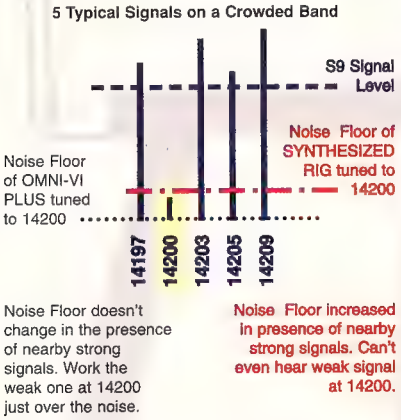

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are invited to mail copies of their newsletter to me so that I can keep the section up to date on activities of our clubs. If you would like to have a club event publicized in the Section News please send copy by e-mail or snail mail two months in advance to me at AB6TA@arrl.org or to my home address listed in *QST*. Brad Wyatt, K6WR, Pacific Division Director, and I are interested in hearing your questions and concerns about Amateur Radio issues so, feel free to communicate them to me and I will pass them on to Brad.

ROANOKE DIVISION

NORTH CAROLINA: SM, W. Reed Whitten, AB4W—ASMs: AB4S, KE4ML, KC4ACE. SEC: WB4SGA. STM: K4IWW. ASTM: W4EAT. TC: K4ITL. SQL: KI4AN. OOC: W4ZRA. PIC: KN4AQ. More information has been added to our Section Web Site <http://ncarrl.org>. We want to provide (or link to) information about ALL North Carolina Amateur Radio activity. If your club or net's information is not correct (or if you have suggestions) please let us know! NTS and ARES training information is already there! FIELD DAY is an important emergency exercise, a contest, a great publicity event, a lot of hard work, a social get together, and an all night party! Be a part of it on Field Day on June 28-29. Find a group, get involved, and have a good time! Don't forget the NTS msgs to the SM and SEC for extra points.(PIOs: stress the statewide, national, AND ALL the local activity.) The quarterly DEC meeting was held at the satate EOC the day before the Raleigh hamfest. We had VERY well attended NTS and ARES meetings during the hamfest. Our STM, SEC, DECs, Net Managers, and ECs are all doing a great job!! Evidence is attendance at these meetings and the response to Hurricane Fran. The organization and the liaison with government and relief agencies has to be in place BEFORE the emergency!! IT WAS!! Thanks to all the amateurs who participate in the ARRL Field Organization's activities so we can fulfill our obligations for providing emergency communications. Thanks to the Alamance ARC and to the participants that helped make the North Carolina QSO Party a success! Congratulations to each categories top scorer: W4NC, W4WS/4, K3WWP/QRP, AA4NC, WA3HAE. Details available through <http://www.ncarrl.org>. Note: Hamfests are not just for buying and selling, don't miss out on the meetings and the social interaction. Also, support those who are sponsoring the hamfests and the vendors who attend. Hamfests are an important part of Amateur Radio. Mayland ARC's Spruce Pine Hamfest 7/12, 25th Annual Cary Midsummer Swapfest 7/19. March Traffic: AB4E 437, W4EAT 291, KI4YV 151, N4WZH 151, K4IWW 145, AF4NC 88, AE4EC 80, WA4SRD 73, K4AIF 71, N4BJX 70, N4UE 68, N9MN 64, AB4W 52, AA4YW 50, K4DDY 48, W4DAC 45, KE4JHJ 44, KE4JWL 39, KE4AHC 35, KD4RYE 30, W4DYW 26, N4SHE 24, KB4FWL 22, N4JTG 22, KE4NKY 21, N5XUJ 20, WD4MRD 16, KE4YMA 13, KT4CD 11, K4QP 9, KC4PGN 9, KQ4SN 8, KR4ZJ 8, @W4RAL 8, KA4KTU 7, K4MPJ 6, KE4WCW 6, KI1R 6, KE4TYJ 5, N2JLE 5, NT4K 4, KF4EML 3, N4YXU 3 [AR]

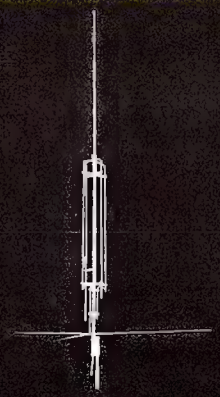
SOUTH CAROLINA: SM, Dave Berry, KE4W (SCSM_ARRL@juno.com)—SEC/ASM/SGL: K8AFP. STM: WA4UGD. OOC: K2PJ. TC: K4NK. BM: KQ4OU. PIC: WB3AZH. ASM: WB4DFW. It was good to see so many at the Upstate hamfest in Anderson! I was recently reading the 40th edition of *The Radio Amateur's Handbook* (1963). It is interesting to see how things have changed: worldwide there were "over 350,000" hams, with about 250,000 in the US. The beacon aboard Oscar II was tracked by 500 hams in 28 countries, and EME was new. Radio Shack had 8 locations, and a 40' crank-up tower cost $119.50. While much has changed, some important things remain the same—The projects in the 1963 edition put many on the air, with the satisfaction of successful building, as can those in the current *Handbook*. Also consistent are two very important aspects; our role in public service activities, and The Amateur's Code. The Radio Amateur is Considerate, Loyal, Progressive, Friendly, Balanced, and Patriotic. Read it, live it. That is what our most recent recipient of the SC Single Sidebander of the Year does. Kelly, K4GLT, congratulations for a much deserved award. Have fun with Field Day this month, and as you operate, do not "hide your light under a bushel." (* denotes Public Service Honor Role) March traffic: AE4UB*141, KT4SJ*119, W4DRF 87, WA4UGD 78, KA4LRM*69, KT4JK 45, KA4UIV* 41, KF4HAV 35, KT4FP 34, K4VIA*27, W4CQB 26, KE4W*25, WD4BUH 25, AE4FA 22, K4NK 16, W4HD 16, WA4HNA 15, W4FBE*14, WB4WTY 14, KQ4SY 12, Total 861 (Up from 537 last month!).

VIRGINIA: SM, Chris Wright, KD4TZN—ASM: KU4DZ. STM: N4GHI @WA3TAI. SEC: K4EC. ASEC: N4SCK. ACC: KA4YUY. SGL: W4UMC. PIC: N***RDQ. TC: W3EDR. Hello everyone. So far it has been a very busy year for all the amateurs in the state. It is great to see all the reports and news articles coming in. The different clubs in the state are very busy and active. This is prime time for thunderstorm activity, so be sure to check your equipment and antenna feedlines coming into your shack. It is also a great time to get out and do antenna projects around your house and to get someone else interested in Amateur Radio. Start getting ready for Field Day, and get as many people involved in radio as possible. I hope to hear a lot of you on the air during Field Day, and hope to see a lot of you at the hamfests during the year. This is a short article, but next month it will be longer. 73 for now. Net QTC/QNI/QND/NM: VTN 168/306/409/K4BGZ; VNE 164/286/393/N4GHI; VNL 41/181/253/WD4MIS; VLN 17/133/220/N3PDK; NVTN 90/416/174/KR4MU; STARES 83/562/837/KD4JMA. Tfc: KE4PAP 1382, K4DOR 746, N4TRX 642, KE4AZL 615, N4GHI 589, KE4YXW 540, KR4MU286, K4MTX 281, K***IBS 271, WD4MIS 185, AA4GL 175, KE4KET 128, N6ANQ 121, W4JLS 107, AE4EF 105, N4ABM 104, WB4FLT 96, W4UQ 92, WB4ZNB 83, AA4AT 78, W4YE 71, WB4KIT 54, KD4JMA 37, K4YVX 35, KE4HFX 29, N4DCC 29, K4IX 27, KS4IG 24, KU4DZ 24, W4HDW 17, WB2KQG 17, KC4JGC 15, KN4OH 14.

WEST VIRGINIA: SM, O.N. (Olie) Rinehart, WD8V—STM: W8UQ. SEC: K8QEW. ASEC: KA8ZOO. SGL: K8BS. TC: K8LG. OOC: N8OYY. ACC: WD8MKS. Good news for Amateur Radio in HR 1013. Introduced in Congress, it will place VEs and OOs under the protection of the Federal Tort Claims Act. Under the FTCA, the government would step in and provide legal defense for any of these volunteers who were sued for actions taken while performing their duties

GAP: The Perfect Antenna

We at GAP realize there isn't a perfect antenna. No singular antenna will scream DX on 80 and be the best for local nets on 10. If anyone tells you there is, beware! The perfect antenna does not exist, but the right one for you may. If you want something to bust the pile on the low bands, then consider the Voyager. Just starting out in ham radio and need a great general coverage antenna, the Challenger is easy to assemble and for little effort will yield superior performance, especially on DX. Maybe you knowingly or unknowingly moved into one of those "restricted areas" where the Eagle's limited visibility, but unlimited ability is desired.



Eagle DX

Challenger DX

Voyager DX

This chart helps you select the right GAP antenna. When comparing GAPs, bandwidth is not a concern. With few exceptions, a GAP yields continuous coverage under 2:1 for the **ENTIRE BAND**.

All antennas utilize a GAP elevated asymmetric feed. A major benefit is the virtual elimination of the earth loss, so more RF radiates into the air instead of the ground. This feed is why a GAP requires **NO RADIALS**. Just as elevating a GAP offers no significant improvement to its performance, adding radials won't either, making set up a breeze.

A GAP antenna has no traps, coils or transformers. This is important. The greatest sources of failure in multiband antennas are these devices. Perhaps you heard someone discuss a trap that had melted, arced or became full of water. Improvements to these inherent problems are the focus of the antenna manufacturer, while the basic design of the antenna remains unchanged. **GAP improved the trap by eliminating it!** Removing these devices means they don't have to be tuned and, more importantly, won't be detuned by the first ice or rain. The absence of these devices improves antenna reliability, stability and increases bandwidth.

Another major advantage to a GAP antenna is its NO tune feature. Screws are simply inserted into predrilled holes with a supplied nutdriver.

The secret is out and people in the know say:

CQ–"The GAP consistently outperformed base-fed antennas...and was quieter."

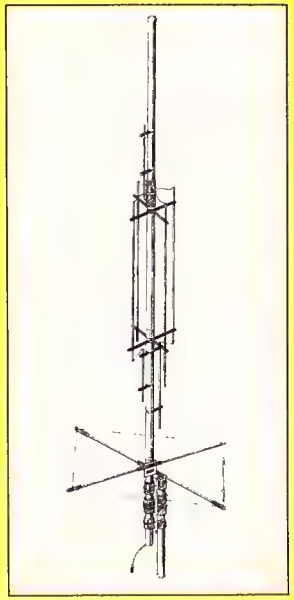
73–"This is a real DX antenna, much quieter than other verticals."

RF–"To say this antenna is effective would be a real understatement. Switching back and forth on 40m between another multiband HF vertical and the GAP, there was no comparison. Signals were always stronger on the GAP, sometimes by S units, not just DB's."

Worldradio – "These guys have solved the problem associated with verticals. That is, an awful lot of RF is wallowing around and dropping into the dirt instead of going outward bound. A half-wave vertical does need radials if it is end fed (at the bottom). But the same half-wave vertical does not (as much, hardly at all) if is fed in the center."

IEEE–"Near field and power density analyses show another advantage of this antenna (asymmetric vertical dipole): it decreases the power density close to the ground, and so avoids power dissipation in the soil below it. The input impedance is very stable and almost independent of ground conductivity. This antenna can operate with high radiation efficiency in the MF AM standard broadcast band, without the classical buried ground plane, so as to yield easier installation and maintenance."

Latest Release: **TITAN DX**



This all purpose antenna is designed to operate 10m-80m, WARC bands included. It sits on a 1-1/4" pipe and can be mounted close to the ground or up on a roof. Its bandwidth and no tune feature make it an ideal antenna for the limited space environment as well as a terrific addition to the antenna farm.

MODEL	BANDS OF OPERATION											HT	WT	MOUNT	COUNTER-POISE	COST
	2m	6m	10m	12m	15m	17m	20m	30m	40m	80m	160m					
Challenger DX	■	■	■	■	■		■		■	■		31.5'	21 lbs	Drop In Ground Mount	3 Wires @ 25'	$259
Eagle DX			■	■	■	■	■		■			21.5'	19 lbs	1-1/4" pipe	80" Rigid	$269
Titan DX			■	■	■	■	■	■	■	■		25'	25 lbs	1-1/4" pipe	80" Rigid	$299
Voyager DX							■		■	■	■	45'	39 lbs	Hinged Base	3 Wires @ 57'	$399

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R-8500

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R-10

IC-2710H

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eter HT

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with tone encode & tone decode
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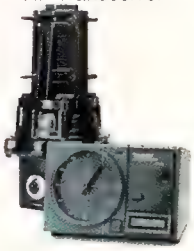
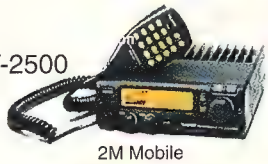


ROTORS

FT-8000R
Dual Band Mobile



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C.O.D.

on behalf of the federal government. Along the same lines, the FCC has also agreed to recognize (not require) an administering VE for all exam sessions. Club call sign acquisition will be a bit harder to acquire as it now requires no less than four members and documentation of an actual organization with a purpose other than collecting call signs. It appears that the vanity call you want might cost more—$50 proposed! Congratulations to the East River Amateur Radio Club and the Plateau Amateur Radio Association in their acquiring their Special Service Club status. I have received several listings of nets being helped around the section, but still need input on others. If your club or group has a daily, weekly or any regularly scheduled net on amateur bands in any mode, please furnish Ron, N8UQ, or me with details, time, frequency, net manager, etc. 73. Tfc: KA8WNO 344, WD8V 312, W8JWX 279, W8IMX 141, KE8FI 123, W8UQ 94, K8QEW 69, WD8DHC 61, KG8GW 13, N8NGI 14. PSHR: WD8V 371, W8IMX 138, WD8DHC 138, KA8WNO 118, W8JWX 112, W8UQ 92.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Tim Armagost, WBØTUB—ASM: Jeff Ryan, NØWPA. SEC: Rich Ferguson, KAØDXM. STM: Mike Stansberry, KØTER. ACC: Ron Deutsch, NKØP. PIC: TBD. OOC: Karen Schultz, KAØCDN & Glenn Schultz, WØIJR. SGL: Mark Baker, KGØPA. TC: Bob Armstrong, WA4SVJ. BM: Stan Morris, NØJOQ. Field Day is rapidly approaching! Is everyone ready? Some of the folks that have been helping with the flooding and weather related emergencies in other parts of the country are probably more ready than most! The last balloon flight hosted by EOSS is being recorded by the FOX network for a documentary scheduled later this year...a bit of irony...the balloon was on a farmer's property somewhere in eastern Colorado and the farmer would only allow 2 vehicles to drive through the gate to recover the balloon! One of the vehicles was the FOX media folks! At any rate a successful recovery was made and congrats to the recovery team! 29 successful recoveries in a row! The president of the EOSS is Larry Cerney, NØSTZ, also the EC for Denver County! The HF leg of the flight was hosted by Sparky Ullmer, KAØDPC, who told us the bands were as flat as he has seen them! One whole QSO! Glad to see the rise in Amateur Radio licenses nationwide with the 2% increase! NTS traffic totals: W5JCV 386, NØUOD 131, Colorado Amateur Weather Net (CAWN) totals: NØDKK 909, WØWPD 854, NØJUS 683, WØLVI 594, KØYFK 327, AAØZR 271, KDØWT 250, NØFCR 239, WØGGP 235, KCØVL 136.

NEW MEXICO: SM., Joe T. Knight, W5PDY—ASM: K5BIS. ASM: N5OQJ. SEC: K6YEJ. STM: N7IOM. NM: WA5UNO. NM: WB5ZME. TC: W8GY. ACC: N5OQJ. New Mexico Roadrunner Net meets daily on 3939@0100 UTC and handled 148 msgs with 1136 checkins. New Mexico Breakfast Club meets daily, 3939@6:30AM and handled 165 msgs with 1045 checkins. Yucca 2-mtr Net 78/18 handled 14 msgs with 717 checkins. Caravan Club 2-mtr Net, 66/06 handled 8 msgs with 70 checkins. SCAT Net, 66/06 handled 12 msgs with 722 checkins. Four Corners Net handled 14 msgs with 413 checkins. GARS Net handled 15 msgs with 78 checkins. QCWA Net with 37 checkins. ENMARC Net handled 1 msg with 27 checkins. The ENMARC now has signs at the Clovis city limits indicating the local Amateur Radio repeater frequency. Sorry to report the passing of W5SZS, K5IPK & KE5CX. They will certainly be missed. KC5LHL's round-the-world balloon flight from Alice Springs, Australia, is scheduled for late December 1997 or early January 1998. They plan to fly the 1.8 million dollar project at approximately 130,000 ft. above the Earth. You can get more info at "www.dymocksflyer.com" on the Internet. The Gila ARS is being granted the ARRL Special Service Club Certificate. Congrats to all the members for their hard work. The Midland, TX Hamfest was reported to be the best ever. KB5VW and his crew did a fine job. Vy Best 73, W5PDY.

UTAH: SM, Jim Rudnicki, NZ7T—Greetings all. June brings one of Amateur Radio's longest running traditions; Field Day. Is your club entered in the Annual Utah Beehive Challenge? If you're interested, contact the Ogden ARC for details. As last year's champs, they earn the opportunity to run this year's event. If your club is not interested in the Beehive Challenge, then at least get out and put Utah on the air. If you're just getting started in ham radio, Field Day is a great opportunity to explore new bands. Find out what HF is all about! Work on your code speed! Try out a satellite! GET INVOLVED. In other news, a major issue is brewing in ham radio today: License Restructuring. Read the WRC-99 Planning Committee Proposal in *QST* or download it from the ARRL Web Site at www.arrl.org. Send your comments to me in writing or via e-mail. I will forward your comments up the line. This is your chance to be heard. In ARES news, Larry White; KC7KDZ of Weber County ARES has developed some neat wallet sized handouts for ARES callouts, and also a pocket-sized handout for wilderness VHF protocol. (See *QST* Aug. 95) This protocol is a suggested procedure for remote hikers or campers shielded from access to repeaters. Check out these procedures. They can be very handy in the remote areas of Utah. I'll detail some of these procedures in next month's edition. Tfc: W7MEL 41. That's all for this month. 73 de NZ7T.

WYOMING: SM, Bob Williams, N7LKH—The Wyoming section staff has undergone some changes in membership. It now consists of: ASM: Jerry Pyle, WB7S <jpyle@ trib.com>. SEC :Steve Cochrane, WA7H, <WA7H@ aol.com>. STM: Rhett Downing, KJ7IM, 307-721-3022. PIC: Gene Epperle, W7JIL, <w7jil@wave.park.wy.us>. SGL: Ken Koski, KB7JUT, <KKOSKI@missc. state.wy.us>. ACC: Mary Williams KF7MC <kf7mc@wave. park. wy.us>. The section welcomes volunteers for other staff positions and staff assistant positions. Contact the section manager or any of the listed staff people to apply. The section mission is to emphasize and advertise the public service provided by Amateur Radio. The ACC will be contacting the Wyoming clubs to encourage them to become ARRL Special Service Clubs where there is specific emphasis on public service. In any event, it is particularly desirable for the Wyoming clubs to become consciously supportive of the Public Relations relating to the PIO tasks, Emergency Communications relating to the SEC task and Operating Activities related to the STM task. These and all staff members will be most receptive to regular club interfaces/contacts.

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SOUTHEASTERN DIVISION

ALABAMA: SM Tom Moore, KL7Q—ASMs: W4XI, KC4RNF, KR4TZ, KL7P, KX4I, KT4JW, KA4PKB, KB4KOY. SEC: KC4RNF. STM: WB4GM. PIC: KE4CAP. BM: KA4ZXL. SGL: KE4RPX. TC: N4TKT. ACC: AD4DB. Field Day is perhaps the biggest single event in the ham radio year that every member of every club can get actively involved in and really expect to have a great time. With over 20 years of Field Days under my belt, I can't remember a single one that was not FUN! Sure it was hot. Sure the bugs were terrible. Yes, an ocassional thunderstorms really messed up our station.. But no matter the difficulties, those of us who DID participate really had a great time. All you need is a desire to have FUN... and you will! Don't forget to send me a message via any of the nets, or packet, for those extra points. In fact, I'm really looking forward to receiving your messages to know who is participating and where. So, in your message, be sure to give me the name of your organization, where you're located, and about how many folks you have participating and any other info you think is of significant interest. A special thanks to all you Net Managers for your time and efforts in regularly sending in your end-of-month Net Reports. We really appreciate them. We've noticed, however, a slight decline in the number of SAR and PSHR reports. C'mon folks, we really need those reports too. On Sat, Jul 12th, we'll hold our annual summer meeting of the ARRL Alabama Section at Country's BBQ in Clanton AL at 10 AM. This will be a special meeting at which some very crucial decisions must be made. Please put this important date on your calendar. It's an open meeting to all, but Alabama ARRL members are especially encouraged to attend.Traffic: AE4JM 4, AE4WP 52, KC4RNF 112, KD4TQN 22, KL7Q 159, KR4ZO 12, W4CKS 169, W4DGH 16, W4NTI 13, W4PIM 152, W4XI 19, WB4GM 222, WB4LJU 78, WB4TVY 20.

GEORGIA: SM, Dot Fennell, KA4HHE—ASM: Dick Walker, N4YPG. ASM: N4UCK. SEC: Tom Rogers, KR4OL. STM: Dick Baxter, K5TF. SGL: Charles Griffin, WB4UVW. TC: Bob Reeves, K4VD. ACC: Cheryl Waters, KB4TJO. OOC/Digital: Ed Tanton, N4XY. PIC: Martha Cromer, AB4CA. BM: Mark Eversoll, KQ4WT. Congrats and welcome to K5TF. STM and KR4OL SEC to the GA SM cabinet. Our thanks to the former STM and SEC. Our weather continues to be very unpredictable, harsh and unrelenting in areas. In GA, we've had several tornadoes this year. We average 21 a year. Our prayers and sympathies to those in other areas who have and are still suffering severe and unusual weather. The SAREX contact between STS-83 and the Sonny Carter Elementary School was cancelled due to a malfunction and early recall of the shuttle. Needless to say, there were many disappointed children and adults. Maybe another time. Lots of festivals and special events on club calendars. Be sure and let us know about them. The computer bug is really biting lots of folks! More and more are joining the fun, learning and sharing knowledge with each other. Understand the Callbook— after the 1997 issue— will only be available on CD-ROM version due to popular demand. It is very disturbing and distressing to me to hear of and hear the interference, language, and innuendoes on VHF, HF and packet. Remember fellow hams, this is a hobby! We are to conduct ourselves as professional and be an example to our youth and others who are considering getting into Amateur Radio. Also, remember the penalties and consequences of actions can be severe and embarrassing. We do not want to jeopardize our keeping the amateur bands by our unsavory use of the airwaves. Clubs around the state are making plans for Field Day. Plan to participate. Take the family and have fun! I would like to thank ALL of you for your support, encouragement and help during my term as Section Manager. I really appreciate ALL of you , the great teamwork, and the supportive SM cabinet members. What a wonderful ham group we have in Georgia. My term will expire in October and I will not seek the office again. Our prayers and sympathy to the family of K4WWL, who became a Silent Key. God Bless, Dot, KA4HHE. Tfc: K5TF 125, W4AET 110, KA4HHE 84, AD4KA 93, WB4GGS 87, KA4HHE 84, KE4NAY 72, WU4C 56, K4VHC 55, K4BEH 16, KJ4TY 8, N4DOM 6, W4WJK 6, K4BAI 4.

NORTHERN FLORIDA: SM, Rudy Hubbard, WA4PUP—ACC: WX4J. ASM: N4ADI. ASM Youth: KO4TT. BM: N4GMU. OCC: WB4GHU. SEC: WA4NDA. SGL: KC4N. STM: WX4H. TC: KO4TT. PACKET: N4GMU. Amateur Radio Volunteer Services Act of 1997 (HR1013) has been introduced by US Rep Anna Eshoo of CA. All hams are urged to write their Congressman for support. This bill, if passed, would help protect the personal liability of volunteer operators while performing duties on behalf of the Federal Government. How many of you are fed up with the lack of the FCC enforcing the rules and regulations? Well, let's do something. Write your Congressman, and Senators requiring the FCC to enforce the present laws. No new laws are needed. What is needed is sufficient funds to pay the enforcers to do their jobs. If we all do this, the money will be made available. While writing letters, write another letter insisting the NWS not be curtailed. Those of us in Florida know what the NWS means in times of bad weather. The ARRL National Convention schedule for JAX Hamfest have listed the forums and programs in five categories that are: Public Service, Education, Operating, Legal & Regulations and Technical. Take note, Orange Park and Clay County Ordinances exempt Amateur Radio. The Clay County code now contains a new paragraph which reads "towers that are erected and used by Amateur Radio operators licensed by the FCC are exempt from regulations." Orange Park exempted hams from tower regulations in a parallel ordinance by excluding Amateur Radio towers from official definition of "communications tower". The amateurs are commended for their efforts. All regulations in the state should contain exemptions. This can be achieved by working with the local elected officials. 73, Rudy. Tfc: WX4H 2043, KE4DNO 837, NR2F 443, WA4NDA 291, WC4D 211, WA4PUP 166, AA4FG 166, AD4DO 161, AD4BL 123, W5MEN 96, W4KIX 96, KE4OAV 93, WA4EYU 84, WX4J 77, W1UKR 74, N4BGH 68, KD4SIV 59, KT4TOK 59, N4JAQ 53, KB4DCR 42, WB2IMO 37, K4JTD 36, KC4FL 33, KJ4HS 33, KS4DW 27, AB4PG 23, N4GMU 22, KF4BXT 20, KE4MBY 20, N4SMV 16, WA1RWO 14, KE4ZTP 11, KM4WC 10, KF4EJV 9, W8IM 4.

MIRAGE...100 Watts...$199

Boost your 2 Meter handheld or multimode (like ICOM 706) to a super powerful 100 watts . . . All modes: FM, SSB, CW . . . 15 dB GaAsFET receive preamp . . . Reverse polarity protection . . . Silent cooling fan . . . Free HT-to-amp coax and mobile bracket

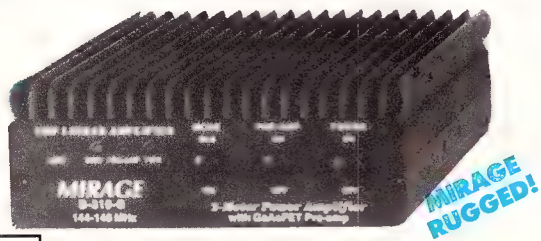
In Stock at ham dealers everywhere!

Call your dealer for your best price

$199

B-310-G Suggested Retail

NEW!



wer Curve -- typical B-310-G output power							
tts Out	25	50	75	95	100	100+	100+
atts In	¼	½	1	2	4	6	8

For an incredibly low $199, you can ost your 2 Meter handheld to a super werful 100 watt mobile or base!

Turn "You're breaking up . . . Can't py" into "Solid Copy . . . Go ahead."

Talk further . . . Reach distant repeaters . Log onto faraway packet bulletin boards.

This rugged Mirage B-310-G amplifier operates *all modes*: FM, SSB and CW. It's perfect for *all* handhelds up to 8 watts *and* multi-mode SSB/CW/FM 2 Meter rigs.

It's great for the ICOM IC-706 -- you'll get 100 blockbuster watts on 2 Meters!

Low noise GaAsFET pre-amp

A built-in *low noise* GaAsFET receive pre-amp gives you 15 dB gain -- lets you dig out weak signals.

Fully Protected

SWR Protection prevents damage from antennas whipping in the wind. *Reverse Polarity Protection* can save your amp if you connect power backwards.

Compact but Powerful

Mirage's integrated *HeatsinkCabinet™* and whisper quiet fan gets heat out fast!

The results? An *ultra-compact* 4¾x1¾x7¾ inch 2½ pound amplifier that delivers a *super powerful* 100 watts.

Free Accessories

Free 3 foot handheld to B-310-G coax cable -- just plug and play! ***Free*** mobile bracket! ***Free*** rubber mounting feet for home use!

Plus more . . .

Automatic RF sense Transmit/Receive switch. Remote keying jack. LEDs monitor "On Air", high SWR, pre-amp, power. Push buttons select SSB/FM, pre-amp, power. Draws 15 amps at 12-15 VDC.

Full one year MIRAGE warranty

With Mirage's legendary ruggedness, you may never need our superb warranty.

ual Band 144/440 MHz Amp

$159.95 BD-35 Suggested Retail

ower Curve -- typical BD-35 output power							
atts Out (2Meters)	30	40	45	45+	45+	45+	45+
atts Out (440 MHz)	16	26	32	35+	35+	35+	35+
Watts In	1	2	3	4	5	6	7

Add this Mirage dual band amp and boost ur handheld to 45 watts on 2 Meters or 35 tts on 440 MHz!

Works with all FM handhelds up to 7 watts. wer Curve chart shows typical output power.

Full Duplex Operation

Mirage's exclusive *FullDuplexAmp™* lets u talk on one band and listen on the other band at the same time -- *just like a telephone conversation!* (Requires compatible HT)

Mirage is the Best! Here's why . . .

- ***Automatic frequency band selection*** --you'll never forget to switch bands
- ***Single input connector and single output connector for both bands*** -- easy to use with dual band radios and antennas
- ***First-class strip-line techniques*** -- superb RF performance and reliability
- ***Custom wrap-around heatsink*** -- runs cool
- ***Reverse Polarity Protection*** -- saves your amp if you connect power backward
- ***Automatic RF sense Transmit/Receive switch*** -- makes operation easy
- ***Low input SWR*** -- keeps your handheld safe from overheating
- ***"On Air" LEDs*** -- for each band
- ***Free mobile mounting bracket***
- ***Free 3 foot handheld-to-BD-35 coax cable***
- ***Small size:*** just 5x1¾x5 inches
- ***Full one year MIRAGE warranty***
- ***Legendary MIRAGE ruggedness***

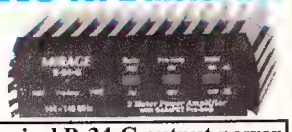
Call your dealer today for your best price!

35 Watts for 2 Meter HTs

B-34-G

$89.95

Suggested Retail



Power Curve -- typical B-34-G output power								
Watts Out	18	30	33	35+	35+	35+	35+	35+
Watts In	1	2	3	4	5	6	7	8

- ***35 Watts Output on 2 Meters***
- ***All modes: FM, SSB, CW***
- ***18 dB GaAsFET preamp***
- ***Reverse polarity protection***
- ***Includes mobile bracket***
- ***Auto RF sense T/R switch***
- ***Custom heatsink, runs cool***
- ***Works with handhelds up to 8 watts***
- ***One year MIRAGE warranty***

MIRAGE RUGGED!

35 watts, FM only . . . $69.95

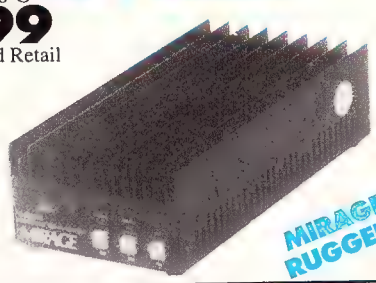
B-34, $69.95. 35 watts out for 2 watts in. Like B-34-G, FM only, less preamp, mobile bracket. 3⅛x1¾x4¼ inches.

160 Watts on 2 Meters!

B-5016-G

299

ggested Retail



ower Curve -- typical B-5016-G output power								
atts Out	130	135	140	145	150	155	160	165
Watts In	20	25	30	35	40	45	50	55

The MIRAGE B-5016-G gives you 160 watts of brute power for 50 watts input on all modes -- FM, SSB or CW!

Ideal for 20 to 60 watt 2 Meter mobile or base. *Power Curve* chart shows typical output power.

Hear weak signals -- low noise GaAsFET preamp gives you excellent 0.6 dB noise figure. Select 15 or 20 dB gain.

B-5016-G has legendary ruggedness. *We know of one that has been in constant use since 1979!*

Heavy-duty heatsink spans entire length of cabinet -- prevents overheating. Power transistors protected by MIRAGE's *Therm-O-Guard™*.

Fully protected from high SWR and excessive input power. Has warning LED.

Has smooth adjustable Transmit/Receive switching with remote external keying.

RC-1, $45, Remote Control. On/Off, pre-amp On/Off, selects SSB/FM. With 18-ft cable.

Draws 17-22 amps at 13.8 VDC. 12x3x5½ in.

More 160 Watt, 2 Meter Amplifiers . . .

B-2516-G, $299. For 10 to 35 watt mobile or base stations. 160 watts out for 25 watts in.

B-1016-G, $379. MIRAGE's most popular *dual purpose* HT *or* mobile/base amplifier. 160 watts out/10 W in. For 0.2-15 watt transceivers.

B-215-G, $379. MIRAGE's most popular *handheld* amp. 150 watts out/2 watts in; 160 watts out/3½ W in. For 0.25 to 5 watt handhelds.

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Technical: 601-323-8287 Fax: 601-323-6551

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MIRAGE . . . the world's most rugged VHF/UHF amplifiers

PUERTO RICO: SM, Guillermo R. Schwarz, KP3S— BM: KP3R. SGL: KP4PQ. ACC: KP4QI. TC: KP4RF. STM: KP3W. PIC: WP4LTF. It's Field Day time folks! We will be visited for the weekend of the 28th by Frank Butler, W4RH, the ARRL southeast area director. I will visit with him the Field Day sites in the island. I have been notified of three groups preparing for the activity. If your group has plans, let me know. The PRARL will meet at the Bacardi plant, but they'll have only sodas to quench the thirst! The Puerto Rico DX Club will have a local site also. The Radio Operadores del Este will have their site in the east side of the island. Get the Field Day fever and go operate at one of these sites or set-up your own. Convince a buddy and go do it, or go camping. Or just have fun at home. Hook-up a battery and run on emergency power. Let's practice for what we don't want to happen for real: a hurricane emergency. CUL

SOUTHERN FLORIDA: SM, Robert "Rip" Van Winkle, AA4HT 941-853-1400—ASM: KA4FZI 941-574-3467. ASM for Youth Activities: WB9SHT 407-336-5608. STM: WV5Z 407-496-5257. SEC: W4SS 407-967-1477. Asst SECs: WB2WPA 941-775-2397. KD4GR 954-748-0775. TC: KI4T 954-791-4275. BM: WA4EIC 941-543-4853. PIC: WA4ATF 813-733-9441. OOC: WB4GHU 941-647-1415. ACC: W3BLW 813-541-2895. SGL: KC4N 904-385-5924. Pkt Mgr: KB4VOL 407-546-2532. Just a quick note to the traffic handlers that noticed that the January Public Service Honor Role Results did not appear in the April *QST*. The January results should have shown up in the May issue along with the February results and I am not sure why they did not make the January Issue. I probably thought I sent them and didn't. Congratulations to the Key West ARC on being recognized by ARRL for being an affiliated club for 50 years as of June. Don't forget the hurricane exercise scheduled by the state emergency management for May 19-21 that I mentioned in last month's column. The plan is for the hurricane to enter North Miami as a category IV and exit north of Naples as a category II. Additional information will be available on the Southern Florida ARES Net on Saturday Morning at 8:00 AM on 3940 kHz. Then the first week of June, The 1997 Governor's Hurricane Conference will be held in Tampa. At present, the Ham Radio Workshop is scheduled for Tuesday Afternoon from 1:00 PM until 4:30 PM. The ARES Net will also have additional information on the conference as we get closer to that date. I failed to mention in last month's news that a new EC has been appointed for Dade County by Manny, W4SS, SEC SFL. Carl Jagielski, KA4HLO, has replaced Norm Ward, K4RBR, as EC for Dade County. Carl certainly has "big shoes" to fill as Norm did a super job and it was good news to hear he is staying as an Assistant EC. I will be leaving for a six week trip on or about April 20th and hope to be back about June 6th. Phyllisan West, KA4FZI, ASM SFL, who lives in Cape Coral will receive the SARs and PSHRs for both April and May. If you send me correspondence or e-mail while I am gone, please be patient and I will catch it up when I get back. Great News regarding Jerry Eichhorn, WB4WDK, EC for Highlands County. After a long illness he underwent a successful kidney transplant operation on March 5th. He received a kidney from his mother and is back on track to good health. Jerry also reports that the Highlands County ARC sponsored the 3rd annual Sebring Hamfest on March 22nd. The event was a well attended success. I received a note from Jay, AD4UQ, that he is continuing to look for the monthly reports from the ECs. Jay compiles the individual reports and forwards the information to ARRL. He has been doing some traveling the last few months that has made it difficult to complete his reports but says that he will not be traveling any more for awhile. On March 29th, Neil Lauritsen, KA3DBK, Pinellas County EC, presented the Highland Lakes Amateur Radio Emergency Services Group (HARES) a brand new Yaesu FT-5100 Dual-band transceiver. The permanent loan of this radio was made possible by a donation to ARES by the Clearwater Kiwanis. Don't forget the ARRL Information Net on 3940 kHz every Saturday morning at 7:30 AM. 73 de AA4HT. Tfc: W3CUL 1271, W3VR 1056, WA9VND 998, K4SCL 646, K4FQU 635, KA2YZM 517, AB4XK 462, KA4FZI 453, W7AMM 410, AA4HT 342, KC4ZHF 296, KB4WBY 211, W4DL 190, AA4BN 178, KD4GHU 164, WB4PAM 155, WA4EIC 152, KD4GR 150, KE4IFD 129, KD4OGV 117, KD4JMV 106, K2GNZ 104, K4RBR 89, WV5Z 84, WT4F 65, AE4OJ 53, W4DWN 52, KB4MON 36, KT4XK 33, KE4WBI 32, WD4JNM 22, WB4GCK 21, KE4UOF 20, W6VIF 18, WB4TOV 15, W4WYR 14, W1KAM 13, N1RT 11, WA8EXA 8, AJ4Y 8, K9EHP 6, W4WLR 3, K4ENA 3, K4OVC 1, W3JI 1.

VIRGIN ISLANDS: SM, John Ellis, NP2B, St. Croix— ASM: NP2E, St. Thomas. ASM: NP2L, St. John. SEC WP2P. PIC: KV4JC. ACC: NP2DJ. NM: VP2VI/W0DX. Hurricane exercise at VITEMA involving all three islands, seems like we just got out of the season, and we're back into it again. St. Croix ARC sporting new embroidered club shirts. SM wants to wish Sandy, AC1Y, and XYL Helen Ann Gerli, KA1KBY, success in their new embroidery venture. Lou, KV4JC, back in the states as this is being written, wish him a speedy recovery. Understand that all VI extra class calls have now been taken with issuance of WP2Z. St Croix ARC will again provide communications to the America's Paradise Triathalon. Both VIARC (St. Thomas) as well as SCARC (St. Croix) planning Field Day extravaganzas - now if band conditions will cooperate -been pretty crummy lately, can only get better now. Come visit us, it's nice in the islands. 73, John, NP2B.

SOUTHWESTERN DIVISION

ARIZONA: SM, Clifford Hauser, KD6XH—The 48th International DX convention held in Fresno, California, is over and Arizona participation was very good. All three (3) Arizona DX clubs, Northern, Central, and Southern, were well represented with even a few from Kingman and Bullhead City. Our own Ned Stearns, AA7A, gave an excellent talk (standing room only) on radio wave propagation past, present, and future, and showed the expected sunspot rise between now and the year 2003. Frank Smith, AHØW, showed slides of this trip to Midway Island and also provided a history lesson on the importance of Midway Island during WWII. Pima County antenna Wireless Communication ordnance will exempt Amateur Radio with a tower height of 100 feet or less. This is a victory for those of us in Southern Arizona. Len Winkler, KB7LPW, says that his radio show "Ham Radio and More" is alive and well. Ned

ICOM HF/VHF/UHF Ham Equipment

IC-756 HF + 6M Transceiver
Special!

Big 4.9" Concentrated Information LCD Display • 5-100W output–variable • All modes • Built-in antenna tuner • Dual watch • Twin passband tuning • 101 memories • **IF-DSP** – Noise Reduction; IF notch filter; Selectable Audio peak; Phase Shift Network modulation/demodulation • CI-V computer interface • Memory keyer • Level/width blanker controls • speech synthesizer • CW announcements • 13.8V option. • More! **$2259.95**

IC-775DSP HF Transceiver
200W–all modes • IF-DSP • Auto IF Notch DSP Noise Reduction • Noise Blanker PSN Modulation • Auto Peak Filter • Dual Watch • CW Pitch Control • Electronic & Memory Keyer • Power MOS FET final Built-in power supply..... **$3899.95**

IC-781 HF Transceiver
HF (150W) AM (75W) • Multi-function CRT Display • 99 Memory Channels Dual Watch • Quad Conversion • Twin Passband Tuning • Built-in Tuner • Built-in AC Power Supply..... **$6599.95**

IC-728 HF Transceiver
• 100W) • All Modes • General Coverage Triple Conversion Receiver • Passband Tuning • Speech Compressor • 26 memories • Dual VFOs • DDS Microphone. included ..... **CLOSEOUT $1099.95**

All ACCESSORIES for items on this page are in Stock.

IC-707 HF Transceiver
100W • All Mode • General Coverage receive 32 Memory Channels • 100% Duty Cycle Minimum Number of Controls • Front Facing Spkr • Large Display..... **SPECIAL $759.95**

FREE OPC-581 Sep. Cable! Limited Time

IC-706 HF/VHF Transceiver
HF + 6M (100W)–all Modes; 2M (10W); no AM • Detachable Control Panel/Display 101 Alphanumeric Memories • General Coverage Receive • Noise Blanker • IF Shift Preamp/attenuator • CW keyer • Full Break-in (QSK) • CW Pitch • Speech Processor VOX/XFC • LCD Display • Scroll Menu System • Built-in Tone Encode • Two antenna Connectors • Filter Options • 9½"w x 3¾"h x 9⅛"d, 9.1 lbs..... **CLOSEOUT $1199.95**

Less $100 REBATE (thru 6/30/97)

IC-2000H VHF Mobile
2M FM • 50W • Wide Band Receive (118-174MHz) • 50 Memory Channels with Alpha Display • TTP mic..... **SPECIAL $269.95**

IC-281H/IC-481H VHF Mobiles
IC-281H: 2M FM Transmit & Receive; 440 MHz Receive..... **CLOSEOUT $379.95**

IC-481H: 440MHz FM Transmit/Receive; 2M Receive..... **$479.95**

Both: 50W • 70 Allocatable Memory Channels • 10 Scratch Pad Memories • Data Switch & Connector for 9600 bps Packet

R-8500 Receiver
0.1 to 2GHz (cell blkd ...**SPECIAL $1899.95**

IC-2350H Dual Band U/V Mobile
2M (45W)/440 MHz (35W) • 118-174MHz VHF Receive • Ultra-High Speed Scanning 110 Channel Capacity ..**CLOSEOUT $399.95**

New Low Price!

IC-2710H Dual Band U/V Mobile
2M (50W)/440 MHz (35W) • Detachable Control Panel • 220 Memory Channels NEW Full Control, Easy to Use Microphone (HM-98) High Speed Scanning.... **$569.95**

IC-T22A *Affordable Beginner's HT!* 2M • 3W (5W @ 13.5V) • Fun, shirt pocket small, easy to use! • Alphanumeric Display • Air Band Rx • 80 Memories; 40 w/alpha display...**$239.95**

IC-T42A Same as IC-T-22A but 440MHz coverage ..... **CLOSEOUT $259.95**

New! **IC-T2A** 2M FM HT w/8-AA batteries and charger **$189.95**

IC-T7A 2M/440MHz Dual Band • Dual Bander at a Single Bander Size and Price • Easy! Works One Band at a Time • 4W (2M) 3W (440MHz @ 13.5V (3W/1.6W out of Box) • No Function Key and "Intuitive" Help Function • Encode/Decode built-in **$309.95**

IC-W32A 2M/440MHz Dual Band • 3W, 5W with BP-173 • Independent band controls • Simultaneous receive of both bands • 200 Memories (100 per band) with Name capability • Cloning capability • Built-in encoder/decoder • Backlit keypad and LCD • Auto repeater function • Weather channel receive capability **$419.95**

New! **R-10-05 Handheld Communications Receiver** Wideband coverage: 0.5 –1300MHz (cell blocked) • FM, WFM, AM, USB, LSB, CW modes • 1000 memories • 8 character. alphanumeric LCD display • 7 scan modes w/priority • Cloning • Much more! **$499.95**

IC-Delta 100H Tri- Band U/V
2M (50W), 440 MHz (35W), 1.2 GHz (10W) 8 Combinations of 2M, 440MHz and 1.2GHz transmit and Receive • 642 Memories Remote Control Microphone **$1259.95**

Other ICOM not Pictured
IC-821H 2M/440MHz SSB/FM satellite transceiver w/mic..... **SPECIAL $1699.95**
IC-2700H 50W 2M/35W 440MHz FM mobile transceiver (standard mic).... **$639.95**
IC-2700H LTD (Infrared mic) **$719.95**
IC-2GXAT/HP 7W 2M HT **SPECIAL $289.95**
IC-4GXAT 440MHz FM HT..... **$299.95**
R-100-11 1MHz-1.8GHz Receiver. **$799.95**

FREE SOFTWARE
A limited supply of W32A & T7A DOS Programming Software included FREE with all W32A & T7A radios purchased while the supply lasts ....

IC-207H Dual Band Mobile
2m/440MHz FM • 50W/35W • Wideband receive • 182 Memory Channels • 9600 baud capability – PC ready • 50 frequency encode/decode • Backlit TTP mic..**$409.95**

ICOM CLOSEOUTS
IC-281H 2M FM, 50W, 9600b..... **$ 379.95**
IC-706 HF/VHF Transceiver..... **1199.95**
IC-728 HF Transceiver..... **1099.95**
IC-2350H 2m/440 FM mobile **399.95**
IC-T41A 440MHz FM HT..... **249.95**
IC-T42A 440MHz FM HT..... **259.95**
R-1-15 .0.1MHz-1.3GHz Scan rx..... **399.95**
R-71A Shortwave Receiver **1199.95**
R-72A Shortwave Receiver..... **899.95**
RP-2210 220MHz Repeater **2199.95**
RP-4020/50W 440MHz Repeater..... **2399.95**

Stearns (Mr. Professor), AA7A, is the co-host and this show is gaining momentum. For the Phoenix area, the time is 1400 hrs local (2200 Z) on Sunday on KFNN, 1500 AM, and on 12.160 MHz (short wave). There is a re-broadcast of each week's show on Sunday at 0500 Z on 5.070 MHZ and Tuesday at 0800Z on 3.210 MHZ. There is no reason for any of us to miss this show because you can also listen on the internet via "REAL-AUDIO" through the home page at "http://www.goodnet.com/~lenwink/hrm.htm". I have listed over 60 clubs within our state. If you are looking for a club to join, just call me or Ron Reynolds, N7WTF, the section ARRL club coordinator. If your club has not received mail from me within the last three (3) months, please let Ron or me know and our records will be updated. The stealth hamfest is over. On April 12th, the Arizona Amateur Radio Club held its third hamfest at DeVry Institute on Dunlap. This event had very good weather with a good crowd of people. All worked out OK and it is planned for the same place next year. Were you able to attend the Cochise Amateur Radio Club hamfest on 03 May in Sierra Vista? If not then plan for next year during the first weekend of May. It is time to make plans for Fort Tuthill hamfest. It is coming up fast, July 25-27, 1997. Have you signed up for the Southwestern Division Convention in September?. See you all at Fort Tuthill. 73, Clifford E. Hauser, KD6XH.

LOS ANGELES: SM, Phineas J. Icenbice, Jr., W6BF—One of my previous articles contained the statement that it should be possible for someone with a mental thruput of about 45 bits per second to send and receive Morse code at about 105 words per minute. I don't think that this speed is or should be a barrier since the 45 bits per second of mental thruput was published and measured many years ago. 75.2 WPM seems to be accepted as the record in the US by McElroy with McDonald a very close second at 75.0 WPM. The interesting thing is that many hams can now send at that speed with a "squeeze key" and find that it is much less effort than using a keyboard. If you are considering using your squeeze keyer for input to your computer and you are already sending code over 60 WPM, you may find it quite convenient to use your key instead of a keyboard. Tfc: Jerry AD0A 71, Hank W6SX 67. If you think that you know your good friend's call sign and you haven't seen or heard from him or her for awhile, guess again. A show of hands for those with new call signs at The Fresno DX Convention, revealed that about one third of the 450 or so present at the banquet now have new call signs! From this response, one might conclude that the FCC did a great job with the Vanity Call Sign Program. Now for the bad news: What enforcement action has the FCC concluded for us in the last 12 months? What can we expect in the future? This was a hot topic of conversation at the DX Convention, and we expect it to be a hot topic at the Dayton Convention, this year. Sending a QSL card with your ideas to your Senator could help! My e-mail works great, and I receive hundreds of jokes every month.— once in a while even a good one. I will share one with you. A car was pulled over for a traffic violation. As the officer approached the auto, he noticed that the man in the driver's seat was not wearing a seat belt. The man told the officer that he just took his seatbelt off to get his wallet from his back pocket. The officer leans in and asks the driver's wife, "What do you think about that?" "Oh, don't ask me," she replied, "I never argue with him when he's drunk."—It was called to my attention that in 1932, Carl Anderson, while studying cosmic rays, discovered the positron or antielectron, the first known antiparticle. This led to a better understanding of antimatter. According to W6BL, Herb, antimatter in our part of the universe is necessarily very short-lived. This is because of the overwhelming preponderance of ordinary matter, by which the antimatter is quickly annihilated. Other articles indicate that material composed of antiparticles, which correspond to ordinary protons, electrons, and neutrons but are their "charge conjugates," ie, they have the opposite electrical charge and magnetic moment. When matter and antimatter collide, both may be annihilated, and other elementary particles, such as photons and pions, are produced. 73 Phineas, W6BF.

ORANGE: SM, Joe H. Brown, W6UBQ—ASMs: Riv Co-Bob, W6LKN 909-686-3823; Org Co-Art, W6XD 714-556-4396; SB Co-Ken, WA6ZEF 909-983-1272; Membership recruiting - Orville, K6LEF 909-737-2388; Sec News/PIC-Gwyn, KE6JOF 909-685-7441. SEC: Dean, KG6YS 909-687-8788. This month's Words of Wisdom are from CNARC's "Circle City Communicator:" WARNING! Dates in calendar are closer than they appear!! And, from a look at all the newsletters in hand this month, the Field Day weekend of June 28-29 certainly fits that description. CLARA's pres Mike, KD6SNE, reports the club holds an annual warm-up for Field Day in celebration of Samuel F.B. Morse's birthday. This year, Roy, N6SLD, will operate W6FZZ on 4/26 from 16:00 to 24:00 UTC. By the time you get this issue of *QST*, WCARC's tried and true member, Joe, KA6LPZ, will have seen the annual El Toro Air Show through to completion. He coordinates volunteers from WCARC, SOARA, CLARA, as well as volunteers from other clubs to work the show, and always does a wonderful job. Fine business, Joe. RCARA's Mark, K6GUK, holds a 2-meter simplex net every Wed at 8:30 PM on 145. 52, and hosts the club's antenna group as well. He invites all with questions to drop in on the net or come to a meeting. Andy, N6IQK of C BAR C wrote, "I hope all...members have noticed that spring is just around the corner, and [the club is] looking for a few good men or women to sit on the board or run for club president." Congrats to CNARC's treas (and my OM), Joe, KO6XB, who is waiting for the last three QSL cards he needs to apply for his WAS certificate. A GTARC director, Bob, ND6N, reminds everyone that planning of HAMCON '97 for the ARRL S/W div is well underway. It will be hosted by the Inland Empire Council of Amateur Radio Orgs (IECARO). Banquet speaker is Astronaut Dr. Ron Sega, KC5ETH, Colonel in the USAF Reserves, and early reservations are recommended because seating is limited to the first 500. If your club hasn't received a copy of the flyer/registration form to include in your club's newsletter, contact Joe Magaditsch, KO6XB, IECARO's sec/treas at 909-685-7441, and he'll see you get one to duplicate for your members. Noted in the HB-CERT Newsletter, "CERT and RACES volunteers donated 10,052 hours to the City of Huntington Beach during 1996. An amazing feat for an org that is only 5 years old!" HDSCS is past the 50 mark now—

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emergencies, that is, not years. Our own SM, Joe Brown, W6UBQ, has also been in and out of the hospital getting his ticker regulated, and we're sure glad to see him back in action! Tfc: N6GIW 468, KO6RZ 312, KC6SKK 196, W6QZ 69, N3IVO, KD6EYI 38, KA6TND 15. Vy 73, KE6JOF.

SAN DIEGO: SM, Patrick Bunsold, WA6MHZ, 619-561-0052—SEC: Pat Ryan, KC6VVT. ASM/MARS: Harry Hodges, WA6YOO. ASM/ACC/PIC: Tuck Miller, KC6ZEC. ASM for Youth: Frank Forrester, KI6YG; STM: Warren Dilley, KT6A. SGL: Bob Spann, KE6BJL. OOC/TC: Del Radant, N6JZE. DECs: North: Dennis, K7DCG; South: Pat, KA6PSG; East: Rich, N6NKJ; Central: Al, W6WYN. FILAMARS (Filipino-American Amateur Radio Society) held their Induction Ball March 22 at the swank Embassy Suites Hotel in La Jolla and it was a truly grand event! Incoming prez is Sal, KC6FDK, and 73 to past prez Willie, N6VVZ. Guest speaker was Bob, W6RHV, SANDRA prez. After an excellent banquet, the band After Image played until late hours! Thanks for inviting KB6RCT and myself!! Many San Diego area Hams made the long trek to Fresno for the International DX Convention! Gene, WB9COY, demo'd effective antennas at the Palomar club mtg. North Shores and Escondido clubs had fine mid-year Auctions! ARC of EL Cajon hosted ICOM for a demo of new rigs. Sizzler was the site for Convair ARC's April meeting. ROARS continues to have exciting T-Hunts and will sponsor the main one at the 98 ARRL Convention! Remember the HAM SWAPMEET 1st/3rd Sats at Santee Drive-in. ARES Sunday NETS: 3905 @ 9 AM, 146.265 @ 7 PM. APRS: 145.790! Traffic: SDCTN: Sess 28, QNI 313, QTC 125. ARESN: Sess 4, QNI 13, QTC 2. Tfc: KT6A 650, KD6YJB 210, KO6BU 72, WA6IIK 2, KD6NZQ 1. PSHR: KT6A 140, KD6YJB 81. Internet e-mail: wa6mhz@juno.com, wa6mhz@amsat.org. Packet ADR: WA6MHZ@WA6BGS.#SOCA.CA.USA.NA PBBS: WA6MHZ-10 (via UWUNOD) on 145.630.

SANTA BARBARA: SM, Robert Griffin, K6YR (see pg 12 for address, phone & e-mail)—Your section cabinet members are: SEC: Jennifer Roe, AA6MX, ACC: Chuck McDonald, K4CAN. BM: Howard Coleman, W6HQA. OOC: Tom Perkins, KD6BXM. PIC: Jeff Reinhardt, KM6II. TC: Warren Glenn, KM6RZ. ASM: Doc Gmelin, W6ZRJ and our DECs: SB- Esther Miller, KK6AD; SLO- Jack Hunter, KD6HHG and Ven- Dave Gilmore, AA6VH. Remember, they represent YOU! Make plans to attend the 1997 Santa Maria Swapfest sponsored by the satellite ARC at New Love Picnic Grounds on June 15th. The Santa Barbara ARC Bazaar is set for July 12 at the Elk Lodge in Goleta (9 A - noon). Contact N6IS or WD6ESU. Mark your calendars! Paso Robles ARC has a Web Site thanks to Jerry, WA6OWR. Check on it: http://www.fix.net/~jparker/prarc.htm. Archie, W6ALM, pumpin out a sweet newsletter for the SMARTT Assn. Keep up the good work, OC! I hear a rumor that the satellite ARC is gearing up for a '97 edition of the Central Coast Amateur Radio Op Phone Directory. Could not get along without mine. These updates are a major club project, so volunteer by contacting Eric, WB6FLY, or Paul, K1JAN, today! SM ARES VHF Net: Mon 8 P 145/140 - (146.55 simplex last Mon/mo). NoSB/SLO area net-of-interest: Gold Coast, Mon 7:30 P 146.940 - SB area 146.19 + nets include: Mon-ARES 7:30 P, SWAP 8:00 P; Tues- Young People's 7 P; Wed- SBARC 7:30 P; Thurs 8 P Yls. SoCal CW Net (W6ZRJ, NM) is 3598 kHz, 7:15 PM local, Mon-Fri. Net Control Stns will slow speed to comfort of any check-in. SCN/SB is your Section Net: 147.000 + (131.8 PL) nightly at 9 P. Tfc/PSHR: K6YR 268/195, W6ZRJ 49/-, KE6MIW 39/126, KM6RZ 6/-, KK6NQ 2/90, WA6DQK 1/83. In memory of SKs N6MB and N6ZJ.

WEST GULF DIVISION

NORTH TEXAS: SM, Bob Adler, N5NY— Pkt N5NY@N5NY.#DFW.TX, e-mail: n5ny@arrl.org. ASMS: W5GPO, W5IWE, KG5SC, WD5IVD, KB5LES, WB7NPH, N5UQA, KB5YAM, N5WOY, KJ5AE, K5RE, KA5TTO, K5LP, K5SXK, K5ZSB, KK5NA, KK5QA, KJ5GE, KC5EWI, KB5RKN, KC5AYL, KB5JBV, KC5DRS, W5FB, KX5K. ACC: K4TTT. STM: KA5TTO. SEC: K5UPN. PIC: WW5L. SGL: N5GAR. TC: KJ5BA. OOC: WB5UDA. BM: WO5H. HamCom '97 is here, June 6-8th. Please make sure you visit us at the ARRL booth inside the convention center, and we'd also be much obliged if you can join us for the ARRL forum on Saturday. Director Haynie will be on hand, as well as Vice-Director Boone, to answer your questions or hear your comments in regard to issues that you feel are important to the future of Amateur Radio. I am also planning to be there, along with many of your section's leaders. I am looking forward to the fellowship of many visits with some old friends, as well as having the opportunity to meet with some new friends too. For any of you who are CW aficionados, let me suggest an idea for some fun, that would also be a great service to all of us. North Texas is the proud sponsor of the new CW net, "NTX," that meets on 3660 kHz nightly at 1900 and 2200 local time. Net Manager KF9AS is looking for assistance in filling NCS and liaison slots, but you need not feel obliged to commit to anything, in order to check in. Just QNI as often as you like, and have some fun on the old brass. Recommended net speed is 15 WPM, but everyone will QRS if needed for anyone wishing to check in. TSN, the Texas Slow Net, meets nightly at 2000 local time, on 3619-21. NTX ARES meets weekly on 3873, Mondays at 1930. The NTX VHF Section Net meets each Wednesday night on 145.19/R (-600 kC, with PL of 110.9 Hz). This month the section spotlight is on our SGL, Tom Blackwell, N5GAR. Tom is a dedicated member of our staff now for some time, and has been instrumental in several areas of our concern. Tom's efforts on our behalf have been relentless, and have proven to be productive. One could not ask for a better description of what an SGL might do on the behalf of the folks he represents. North Texas has a Web page, which is under construction but is starting to take shape. Please look for us at Web address www.lsic.net/ntexas. There are links from this site to many other Amateur Radio related sites on the net. Thanks to Don Mathis, KB5YAM, for his generous offer to be our "webmaster," and provide the Web site for us on his computer. As of July 1, I will be resigning as your Section Manager. I have enjoyed the opportunity to serve in this position for over four years, and I am forever grateful to all of you for your support and your friendship. This has indeed been one of the most rewarding endeavors which I have ever had the privilege of being a part of, and I salute our section staff for the dedicated work that all of you have put forth on the behalf of all Amateur Radio operators in North Texas. It is all of you who deserve all of the credit for our successes, and I look forward to working with all of you in a supportive role, in the near future. BPL: N5NY 982, KC5QGI 665, KB5GLV 537, KC5OZT 519. Tfc: KC5NEZ 242, KF9AS 239, KA5TTO 188, KC5QZZ 98, KB5TCH 56, KC5DRS 52, WA5I 42, KC5WEG 42. 12 people earned PSHR for the month! Great job y'all! NTX Nets (Sessions/QNI/QTC): "NTX"/31/126/87, TTN/31/1013/313, DTTN/31/210/157, TSN/31/168/102, NETX/31/143/67, DFWE/31/450/272, DFWL/31/260/229, NTXD 1882 QTC Digital. DRN5 report from WB5YDD: 62/XX/568. NTX 89% by: W5AYX, K5MXQ, KD5RC, WD8LDY, KF5BL, WB5NMH, W5LNM. That's all for this month. Till next time, God Bless and very 73 to all de Bob, N5NY.

OKLAHOMA: SM, Coy Day, N5OK—ASMs: N6CL, K5CPZ, KB5ZUD. SEC: W5ZTN. STM: AB5RV. ACC: KB5BOB. PIC: WA9AFM. OOC: K5WG. SGL: W5NZS. (http://www.telepath.com/n5ok/) Oklahoma amateurs participated in Salvation Army support for the Arkadelphia tornado disaster. A team of TARC members overcame many technical difficulties to successfully implement their emergency plan. Those participating included: Vince/ N5RFW, Lou/ N5TXA, Ann/KC5TRJ, Les/KC5VCK, Sister Virginia/ KC5HSU, Ted/KB5UUX, Kelley/KC5IGV, Gary/KC5OIX, Joel/WA6HNO, Richard/WB5IQS, Richie/KB5SNY, Chris/ KJ5OM, and Charlie/AB5EF. Norm/W5FLO reports QCWA Central Oklahoma Ch 63 continues to grow with 101 members. Oklahoma amateurs will be participating in the 130th anniversary celebration of the Chisholm Trail, July 14-20. J.D., WG5B, reports that AARKI had a very successful Weather Watch Training Seminar and that they purchased the 147.300 repeater in Lone Grove. WB5OSM reports, Eastern Oklahoma NW Arkansas SKYWARN network was activated six times during the month of March in support of the National Weather Service. This year's Green Country Hamfest was a tremendous success and 22 persons obtained or upgraded their license. Emergency Management Offices in Kay county recently recognized the following amateurs: Mike/N5JJR, David/KD5FX, Sherman/KI5IF, David/ N5XDN, and John/ WB5YSX, for their support. Tfc: K5GBN 283, WB5NKC 525, KE5JE 270, WB5NKD 246, WA5OUV 78, KI5VV 62, W5REC 59, N5IKN 59, KI5LQ 47, K5CXP 41, AB5J 37.

SOUTH TEXAS: SM, Alan Cross, WA5UZB—Good news out there, we have well over 250 volunteers on the roles helping Amateur Radio grow and remain viable in our section. To all those who volunteer their time and talent; I thank you. The West Gulf Division's convention will be held in Humble (north of Houston) on October 17 - 19, 1997. For additional information on this convention, contact KK5LG, or their website. The Austin convention has been changed to the South Texas Section convention, and is being held on August 1-3, 1997 in Austin. Additional information is available from W5HS and various websites throughout the section. Congratulations to Brian, N5BA, the newest HF Awards Manager for the section. Brian is a member of the Northwest ARC, as special services club. Brian will be responsible for validating WAS and 5-Band WAS applications in this area. There continues to be a record number of affiliated clubs renewing their charter; including this month the Hill Country ARC and the Houston ECHO Society. My personal thanks! to the membership of the Brazos Valley ARC for having Bill, N5LYG, the STX bulletin manager, and myself, out for this month's meeting. It was a lively crowd, good questions asked, and both Bill and I enjoyed the evening. Thanks! From the looks of the newsletters, all the clubs in the Section are ready for Field Day. This year PLEASE have a small group of concerned hams with your organization work their hardest at getting publicity for Amateur Radio. If not for your efforts, then for the general amateur community. Hal, W5MDL, will be glad to assist you in all your endeavors (how to generate press releases, public service announcements, meeting with the public). Now is the time to really "turn up the heat" in your publicity efforts. Besides the publicity, don't forget to invite your coworkers, friends, the neighborhood kids (and their parents), the local Girl and Boy Scout unit, an elected official or two, and anyone else that you want to expose to our service and hobby. Headquarters will have plenty of material for you to use, but you can develop your own, specific to YOUR community. Let Hal and I know of your successes in this endeavor. I have a request of all readers to this column, it concerns recruiting. I've asked, over the years, for volunteers to help the section. The response is great! Now ask for your help in a different arena —that of YOUR club and for the ARRL. Only 24% of all amateurs belong to the ARRL. And in any given community in South Texas, about the same number belong to their local club. I'm asking each and everyone of you to recruit at least one person into your club and into the ARRL by the time the Division convention comes around. And I want to hear of your success' at the convention. There are no rewards or awards other than supporting your local and the national efforts with members. Think about what it will do for your club, and for the national organization. Thanks es 73, Alan, WA5UZB. Tfc: W5YQZ 1026, KK5QT 898, N5NAV 761, W5SHN 435, W5TFB 290, KS5V 208, KB5UCQ 184, KB5RUG 114, WD5GKH 89, W5KLV 89, WB5YDD 79, W5CTZ 77, W4RRX 67, N5BMB 57, WA5FXQ 53, W5ZIN 46, W5RZV 39, KG5CX 36, N5OUJ 29, N5JUU 13.

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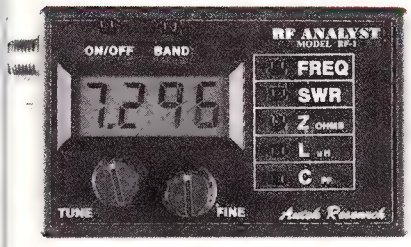

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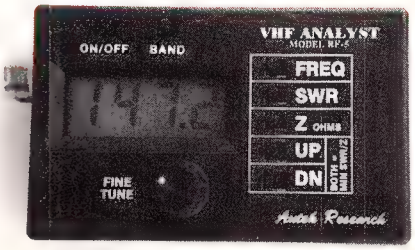

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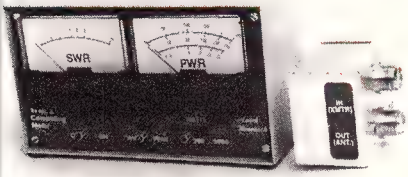

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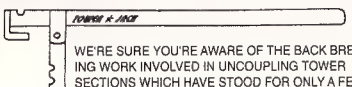

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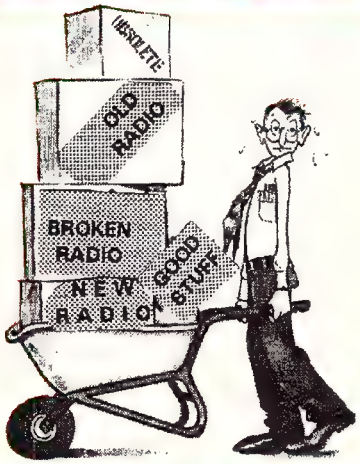

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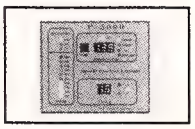
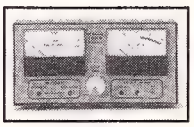
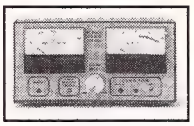

P-3000


P-1500


P-2000A


P-100A

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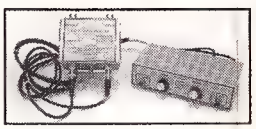
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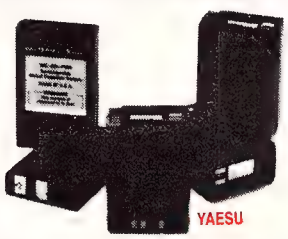

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TELEGRAPH KEYS wanted by collector. Bugs and unusual or unique straight keys or sounders, and tube electronic keyers. Also pre1950 Callbooks. Vince Thompson, K5VT, 3410 N. 4th Ave., Phoenix, AZ 85013, 800-840-KEYS.

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LMR 400 SOLID CCA CNTR FOIL + BRAID 2.7dB @ 450MHz WP/UV JKT	.59/FT	.57/FT	.55/FT
LMR 400 "ULTRA-FLEX" STRD BC CNTR FOIL + BRAID 3.1dB @ 450 MHz TPE JKT	.79/FT	.78/FT	.77/FT
LMR 600 (OD.590") SOLID CCA CNTR FOIL + BRAID 1.72dB @ 450 MHz WP/UV JKT	1.25/FT	1.22/FT	1.20/FT
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RG213/U STRD BC MIL-SPEC NC/DB/UV JACKET 1.2 dB/1800WATTS @ 30MHz	.36/FT	.34/FT	.32/FT
RG8/U STRD BC FOAM 95% BRAID UV RESISTANT JKT 0.9dB/1350WATTS @ 30MHz	.32/FT	.30/FT	.28/FT
RG8 MINI(X)95% BRAID UV RESISTANT JACKET 2.0dB/875 WATTS @ 30MHz	.15/FT	.13/FT	.12/FT
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RG142/U SOLID SCCS 2-95% SILVER BRAIDS TEFLON JKT 8.2dB/1100WATTS @ 400MHz	25FT/UP	1.25/FT	
RG303/U SOLID SCCS 1-95% SILVER BRAID TEFLON JKT 8.6dB/1100WATTS @ 400MHz	25FT/UP	1.00/FT	
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	100FT/UP	500FT	1000FT
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RG11/U SOLID BC FOAM (VP-78%) 95% BRAID UV JKT 1.1dB/800WATTS	.40/FT	.38/FT	.36/FT
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"FLEXIBLE" 450 OHM 16GA COMPRESSED STRD CCS(PWR-FULL LEGAL LIMIT+)	.18/FT	.17/FT	.16/FT
"FLEXIBLE" 450 OHM 14GA COMPRESSED STRD CCS(PWR-FULL LEGAL LIMIT++)	.25/FT	.24/FT	.23/FT
300 OHM 20GA STRD (POWER: FULL LEGAL LIMIT)	.15/FT	.13/FT	.12/FT

ROTOR & CONTROL CABLES

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4090 8/COND (2/16 6/20) BLK UV RES JKT. Recommended up to 200ft	.35/FT	.34/FT	.32/FT
1418 8/COND (2/14 6/18) BLK UV RES JKT. Recommended up to 300ft	.47/FT	.45/FT	.43/FT
1216 8/COND (2/12 6/16) BLK UV RES JKT. Recommended up to 500ft	.78/FT	.74/FT	.70/FT
18GA STRD 4/COND PVC JACKET	.20/FT	.18/FT	.16/FT
18GA STRD 5/COND PVC JACKET	.22/FT	.20/FT	.18/FT
18GA STRD 6/COND PVC JACKET	.23/FT	.21/FT	.19/FT

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14GA SOLID *"COPPERWELD" (for long spans etc.)*	.08/FT	.07/FT	.06/FT
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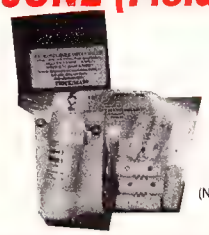

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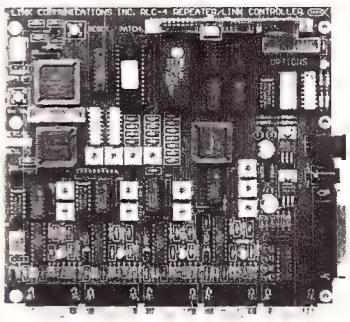

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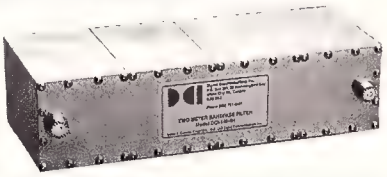

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Mobile radios have better intermod immunity than handhelds, but if the signals are strong enough, mobiles too will be susceptible to intermod. Whether or not this happens depends on the radio, and the strength and frequency of the signals. Some metropolitan areas have so many strong signals that most VHF/UHF amateur transceivers experience intermod. The DCI filters are very effective in reducing intermod in high RF environments.

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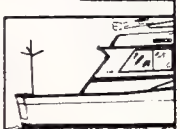

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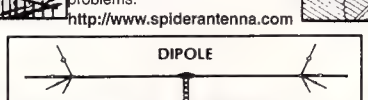

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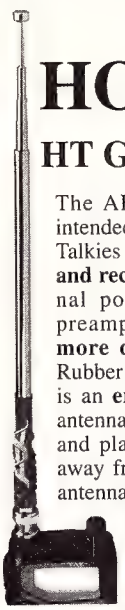

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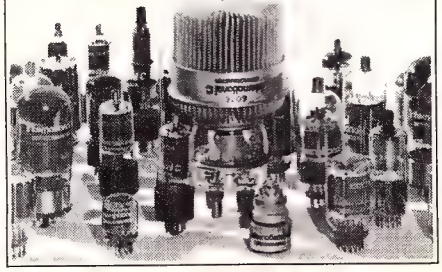

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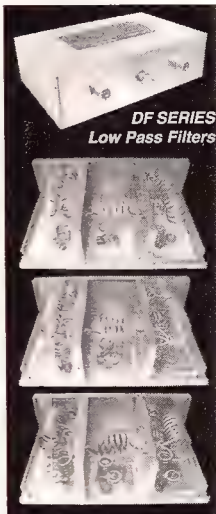

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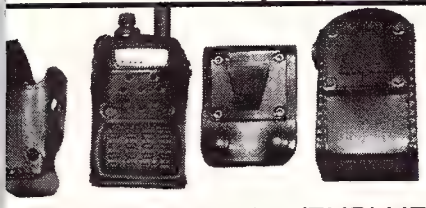

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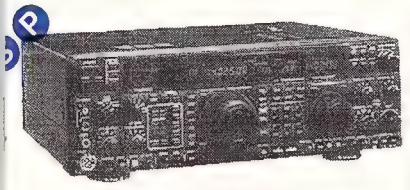

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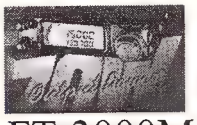
1. DDS (Direct Digital Synthesis)
2. 200 Watts RF Ultra Heavy Duty Power Supply
3. Dual frequency receiver
4. 100 Memories
5. Fast Auto Tuner w/39 Memories

WIDE Freq Cov

70W



FT-3000M

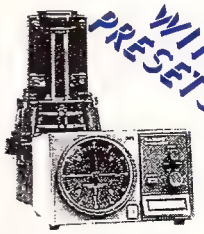
1. 2m Mobile w/70w of Power Output
2. Wide Frequency Coverage
3. Alpha-Numeric Display
4. 81 Memory Channels
5. 1200/9600 Baud Packet Compatible

Smart Search

FT-8000R

1. Compact Dual Band Mobile
2. 110 Memory Channels
3. Enhanced Smart Search
4. Crossband Repeat
5. 1200/9600 bps Packet Compatible

WITH PRESETS!



G-1000SDX

1. Heavy Duty Rotor 23 sq ft
2. 450 Degree Turning Radius

BIG Display

FT-2500M

1. 2m FM 5/20/50 Watt Mobile
2. Omni-Glow LCD
3. Back lit DTMF Mic

LOUD Speaker Audio

(FT-50R)

FT-10R

1. Alpha-Numeric Display
2. Dual Watch with Dual Display
3. Rugged MIL-STD 810 Rated with Loud Speaker Audio
4. Easy to Use w/High Speed Scanning

FT-50R

1. Wide Multi-band rx
2. 3-Selectable Rx modes
3. Rugged MIL-STD 810 Rated
4. 112 Memory Channels

See above for optional Hard Leather Case

General Cov Receiver

FRG-100B

Frequency coverage 50 KHz through 30 MHz 50 Memory channels. Multi-function scanning.

FT-11R

1. 2M HT
2. Alpha-Numeric Display, w/75 Memory Channels
3. Windows PC Programmable
4. AM Aircraft Receive 110-136mhz
5. CTCSS enc

FT-51R

1. 2M/70CM Dual band HT
2. Alpha-Numeric Display, w/80 Memory Channels
3. Spectroscope. CTCSS enc/dec
4. V+V,U+U,V+U Receive

BIG Keypad

(FT-51R)

KENWOOD TS-520S with: DG-5 digital display, DC-DC converter, AT200 antenna tuner, 520S remote VFO, 4 RCA 6146B and 2 Raytheon 12BY7A replacement tubes. Excellent condition. Used less than 100 hr. Original cartons, all manuals. $750. N2NER, 607-655-2955.

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LIGHTNING PROTECTION video seminar still $20. See March *QST* classified for information. North Marietta ARC, 515 Woodforest Ct NE, Marietta, GA 30066.

McElroy equipment, paper, Mac keys wanted. Tom French, W1IMQ, "The McElroy Collector," 151 Barton Road, Stow, MA 01775. 508-562-5573.

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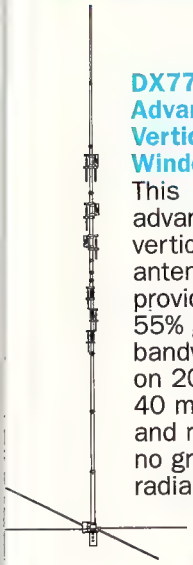

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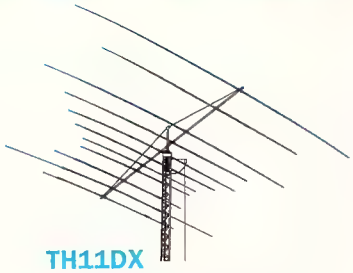

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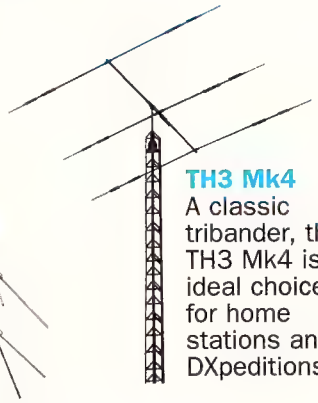

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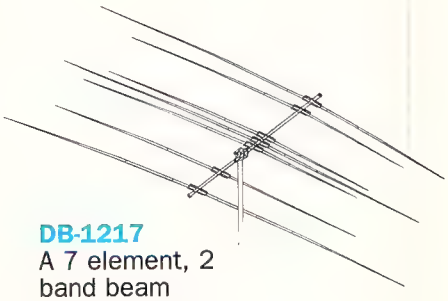

DB-1217
A 7 element, 2 band beam antenna designed for operation on the 12 and 17 meter amateur bands, and packaged for DXpeditions.

V6R
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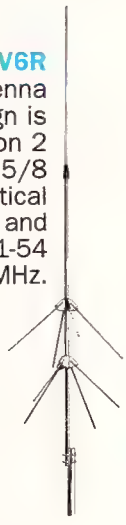

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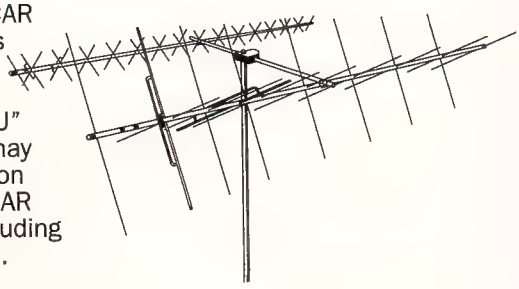

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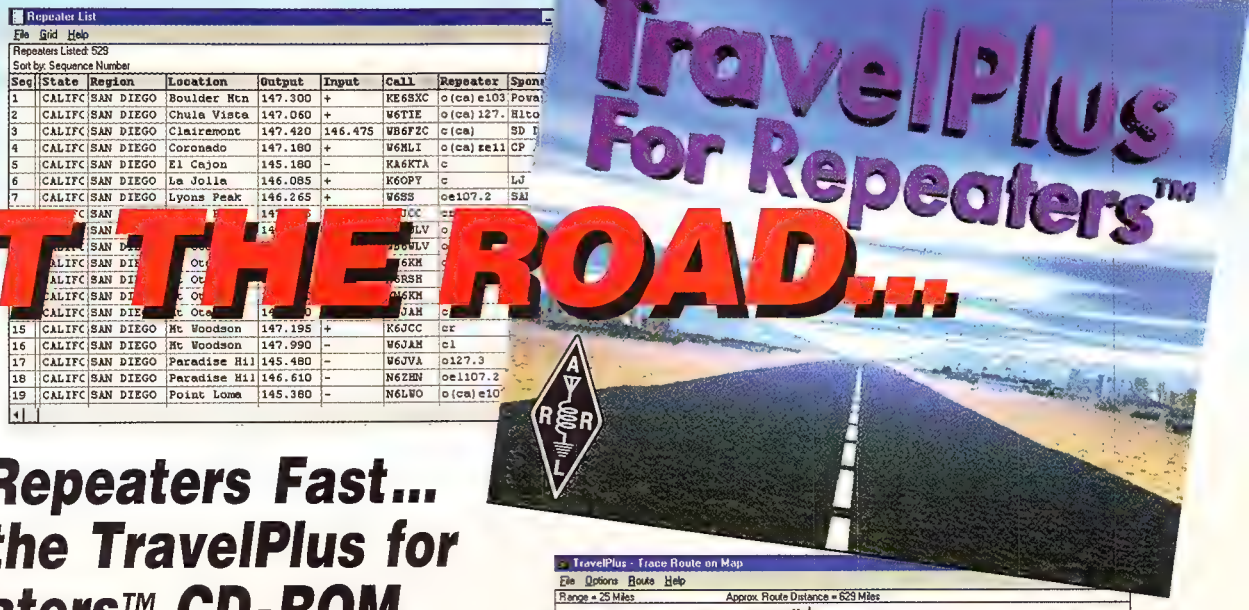

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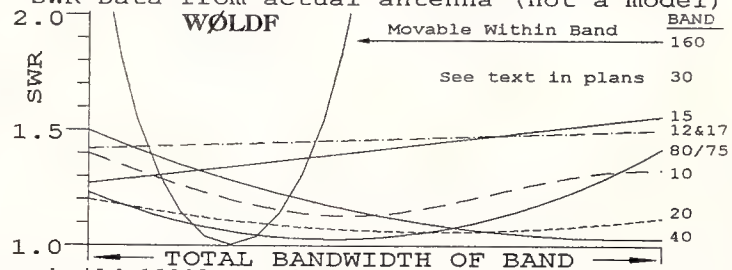

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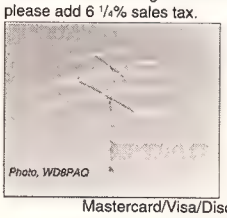

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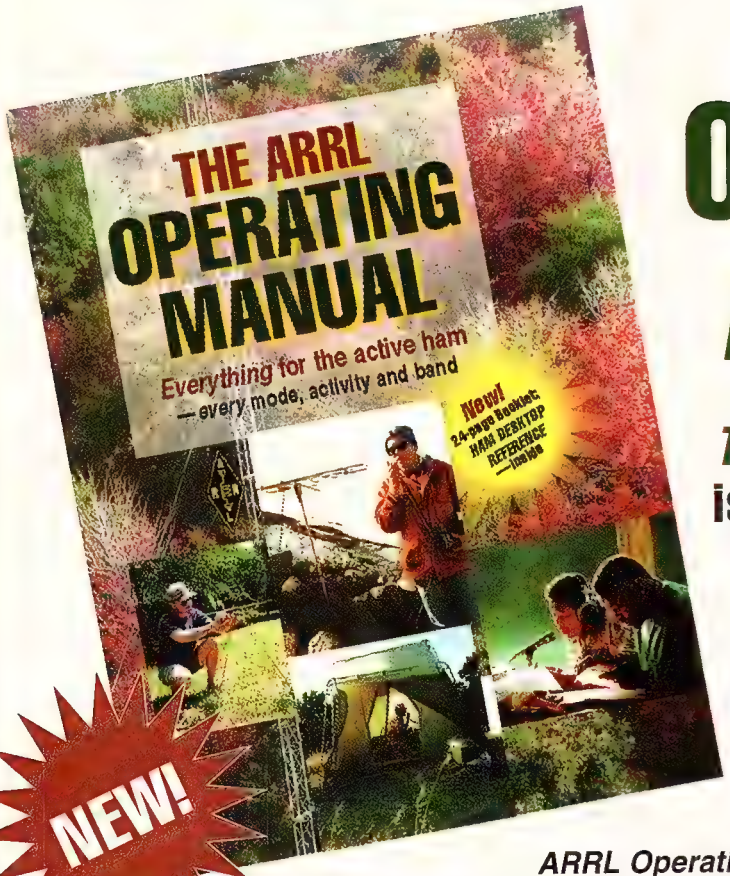

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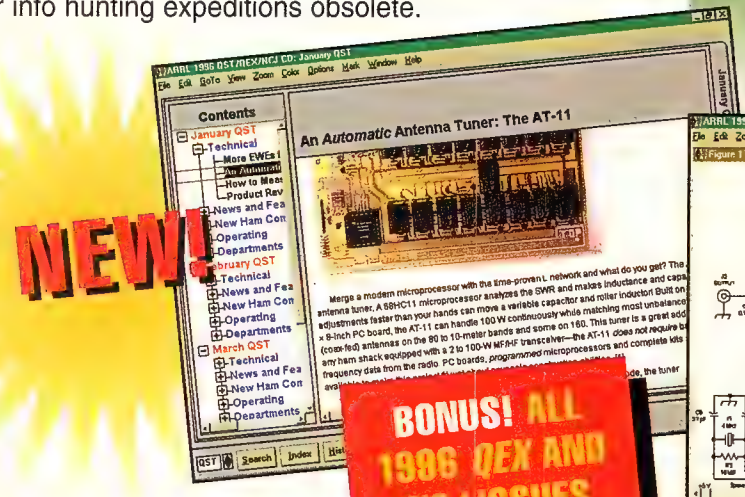

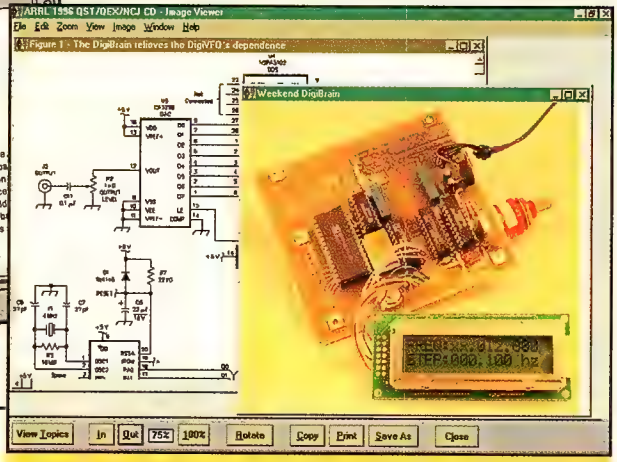

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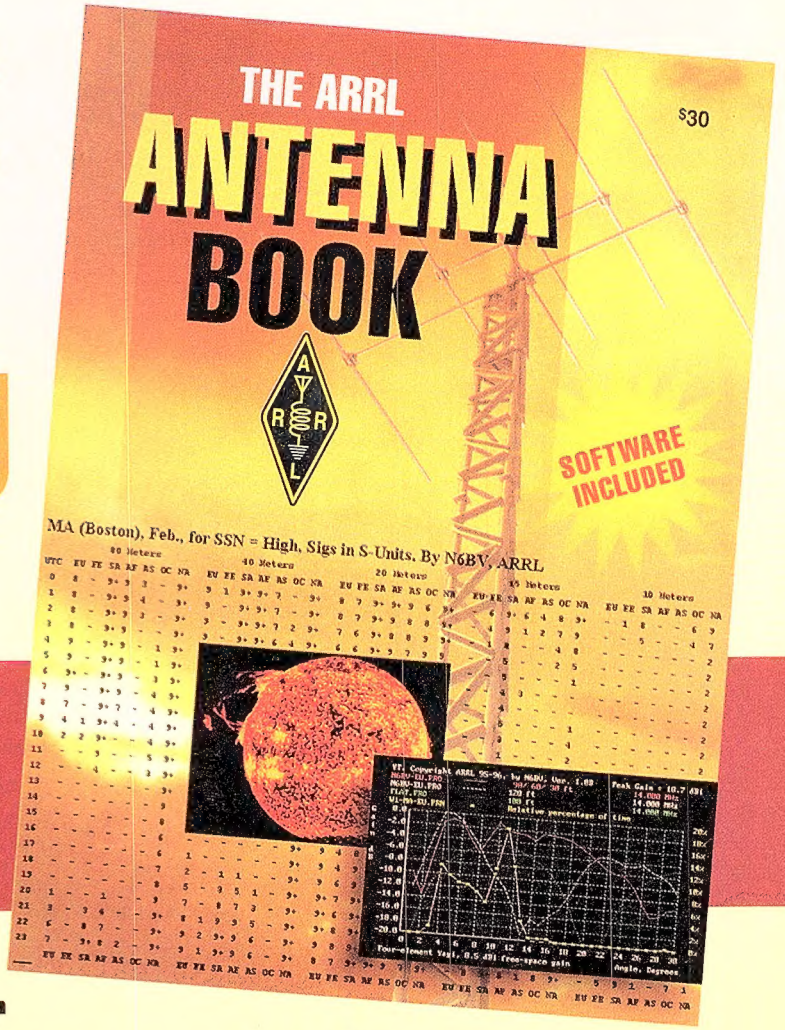

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